

A.

HPIV3 L aa 456 (RSV L aa 521) F→L  
AEISYEYTLKHWKEISLIEFRKCFDFDPGEELSIFMKDKA-HPIV2 F460  
SAISYENAVDYYQSF~~IGIK~~FNKFIEPQLDEDLTIYMKDKA-HPIV3  
SAISYECVDNYSSFIGFKFLKFIEPQLDEDLTIYMKDKA-HPIV1

B.

HPIV3 cp45 L aa 942 Y→H  
LLPSQLGGLNYLACSRLFNRN-HPIV2 Y948  
LIPASVGGFNYMAMSRCFVRN-HPIV3  
LIPANIGGFNYMSTARCFVRN-HPIV1

C.

HPIV3 cp45 L aa 992 L→F  
LARKPGKGSWATLAADPYSLN-HPIV2 A998  
MNQEPGESSFLDWASDPYSCN-HPIV3  
MNQEPGDSSFLDWASDPYSCN-HPIV1

D.

HPIV3 cp45 L aa 1558 T→I  
DIITPIHAPYLASLDYVKLSI-HPIV2 L1566  
GVLNPIYGPNTASQDQIKLAL-HPIV3  
GVVEPVYGPNLNQNQDKILLAI-HPIV1

E.

BPIV3 L aa 1711 T→I  
EQLETDIILHSTLTA-HPIV2 S1724  
EDNILDNIIVKTVNDN-BPIV3  
EDNMLDNIIVKTVNDN-HPIV3  
ADSMILDNITAEVQHN-HPIV1

FIGURE 1

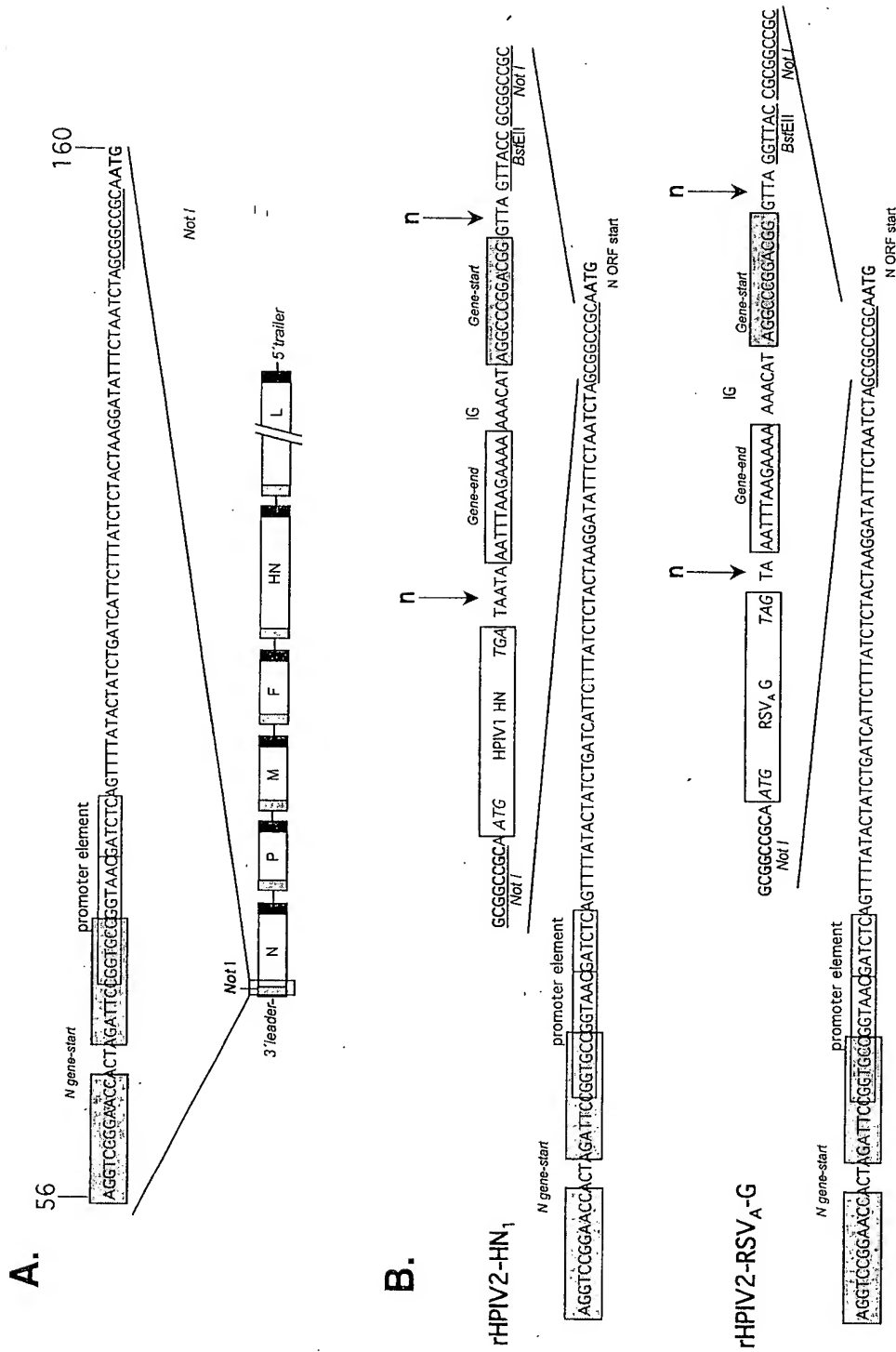


FIGURE 2

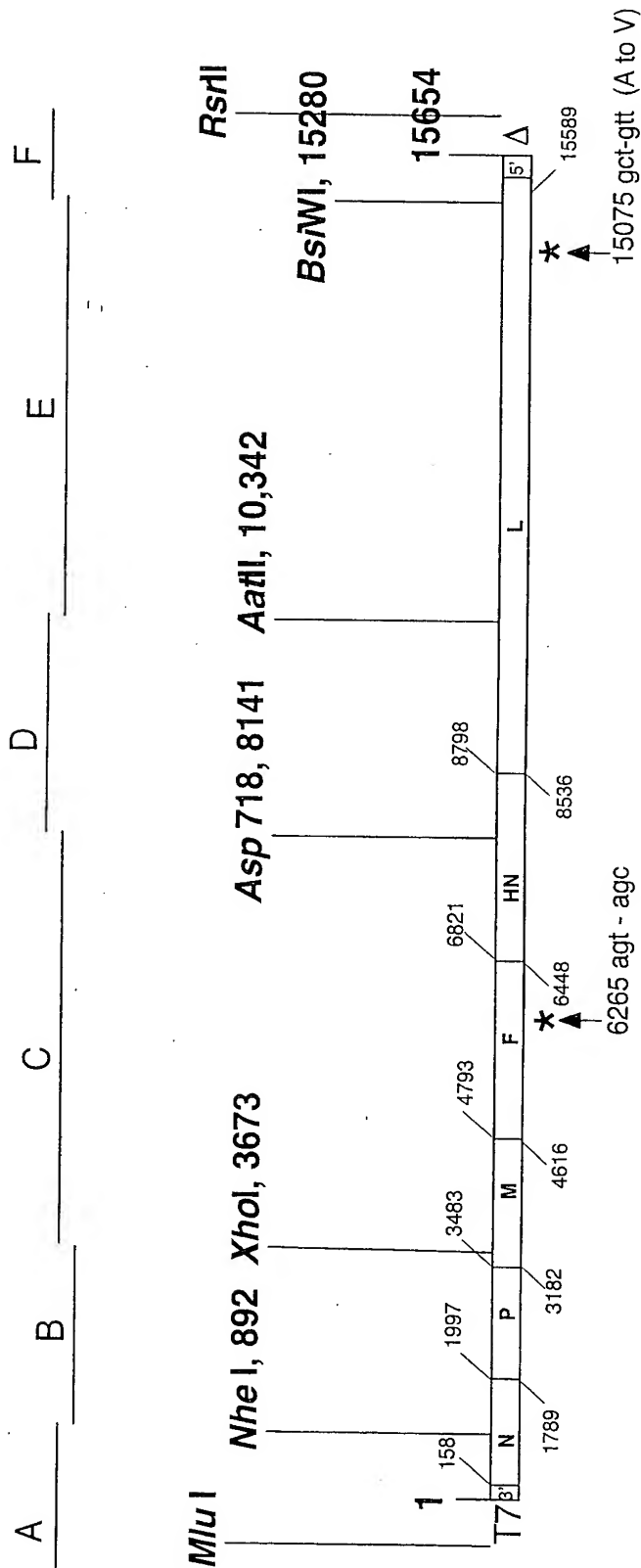


FIGURE 3

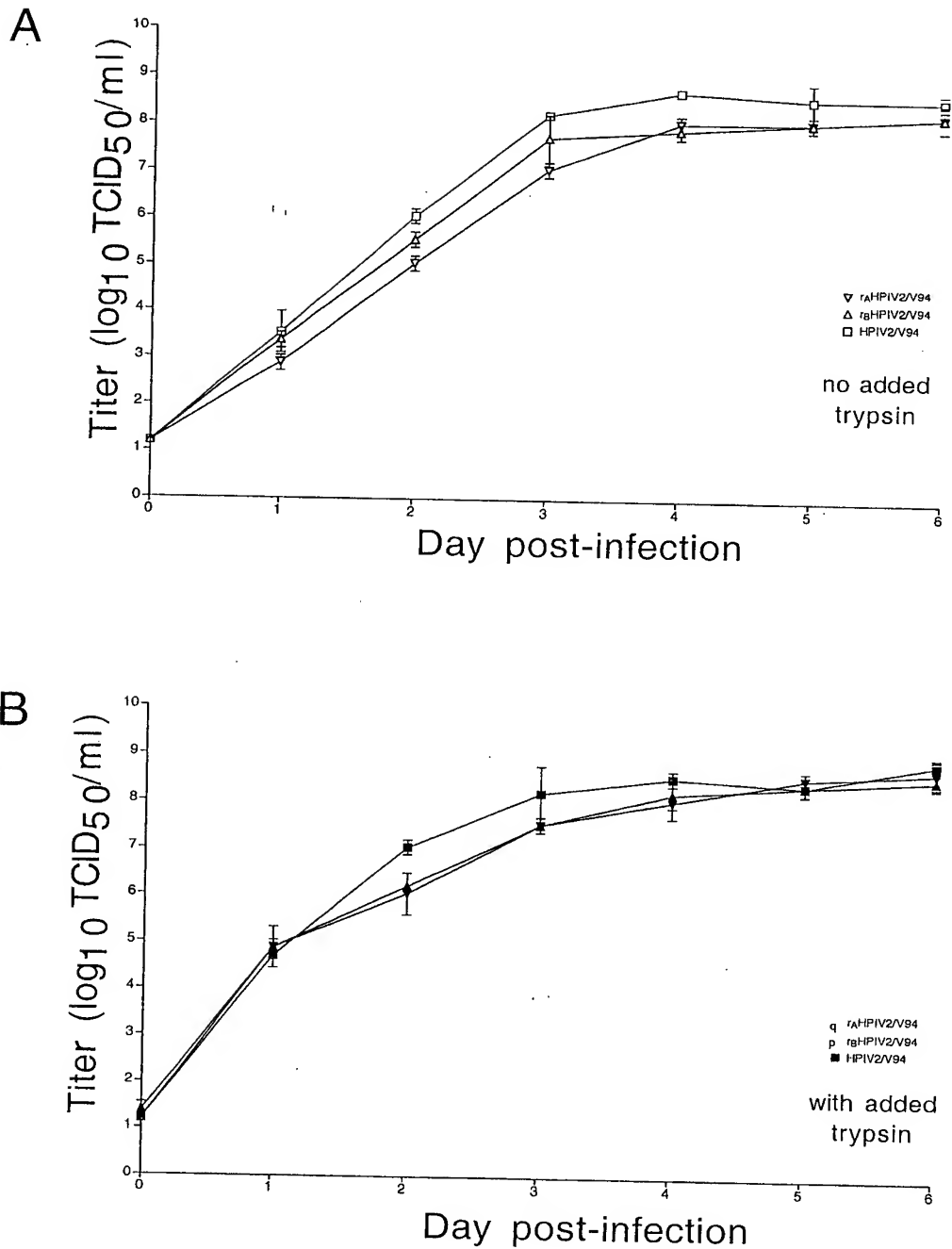


FIGURE 4

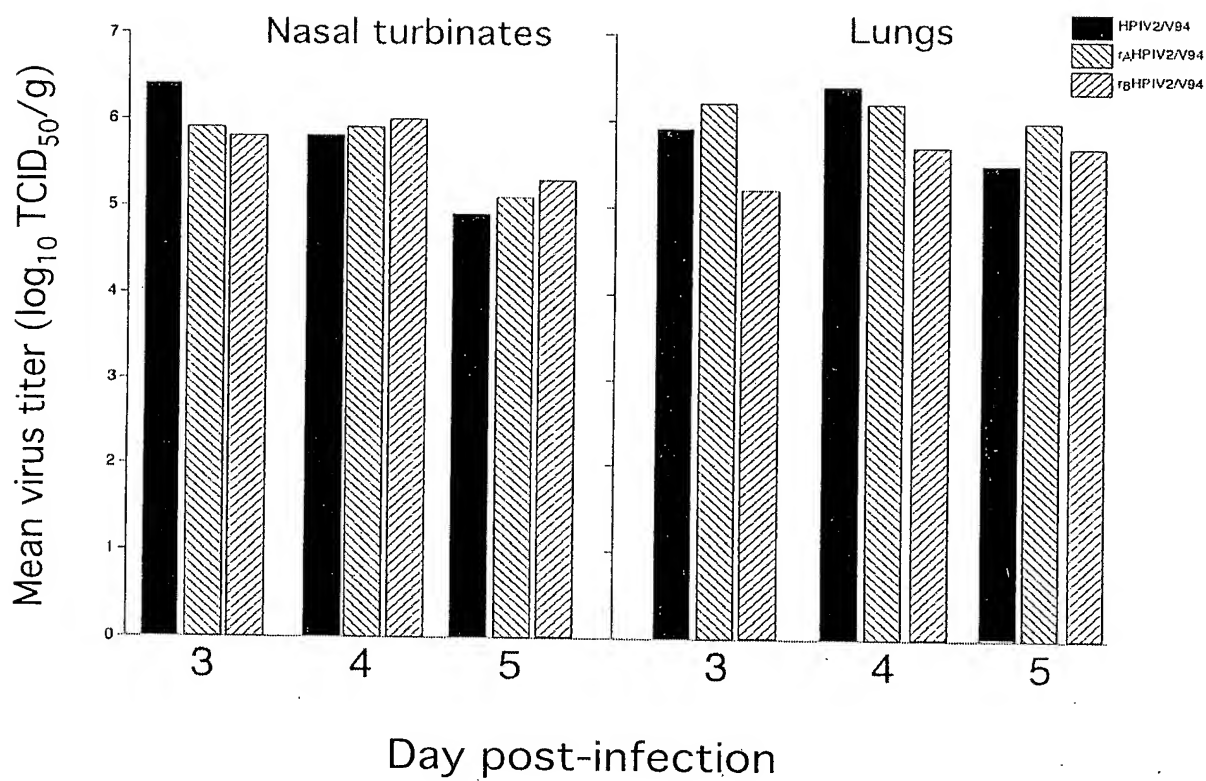


FIGURE 5

A

|    |  |     |         |
|----|--|-----|---------|
| 51 | TACGTAGGTCCGGAACCACTAGATT.CGGTGCCGGTAACGATTCCAGTTT | 99  | Toshiba |
|    |  |     |         |
| 51 | TACGTAGGTCCGGAACCACTAGATTCCGGTGCCGGTAACGATTCCAGTTT | 100 | Greer   |

B

|     |  |     |         |
|-----|--|-----|---------|
| 700 | ATGACTGCTCCTGATCAACCACCAGTATCAGTAGCAAA...GATGGCTAA | 746 | Toshiba |
|     |  |     |         |
| 701 | ATGACTGCTCCTGATCAACCACCAGTATCAGTAGCAAAGCGGATGGCTAA | 750 | Greer   |

C

|      |  |      |         |
|------|--|------|---------|
| 1897 | TCTCTCATAATTTAAAGAAAAAATCATAGG.CCGGACGGGTTAGAAATCC | 1945 | Toshiba |
|      |  |      |         |
| 1901 | TCTCTCATAATTT.AAGAAAAAATCATAGGCCCGGACGGGTTAGAAATCC | 1949 | Greer   |

D

|      |  |      |         |
|------|--|------|---------|
| 2896 | AGTAATTGCCGGTCCAACTAGTGGAGGCTTCACAGCCGAA.CAGGTGATA | 2944 | Toshiba |
|      |  |      |         |
| 2900 | AGTAATTGCCGGTCCAACTAGTGGAGGCTTCACAGCCGAAGGCAGTGATA | 2949 | Greer   |

E

|      |   |      |         |
|------|---|------|---------|
| 2945 | TTGATTTCAATGGATGAAGTACTAGCTAGACCTACACTCTCATCAACAAAAAG | 2994 | Toshiba |
|      |   |      |         |
| 2950 | .TGATTTCAATGGATGAAGTACTAGCTAGACCTACACTCTCATCAACAAAAAG | 2998 | Greer   |

F

|      |  |      |         |
|------|--|------|---------|
| 8595 | TTATACGTTTTGGCTGTATTAGAATGTTATAG.ATTCTGCTGTTTTTCCC | 8643 | Toshiba |
|      |  |      |         |
| 8599 | TTATACGTTTTGGCTGTATTAGAATGTTATAGCATTCTGCTGTTTTTCCC | 8648 | Greer   |

G

|      |  |      |         |
|------|--|------|---------|
| 9894 | TGGGGTCATCCCACTCTTACTGCTGCGCAA...GTGGGTAAAGTGAGAGA | 9940 | Toshiba |
|      |  |      |         |
| 9899 | TGGGGTCATCCCACTCTTACTGCTGCGCAAGCTGCAGGTAAAGTGAGAGA | 9948 | Greer   |

H

|       |  |       |         |
|-------|--|-------|---------|
| 10991 | TGATATCTTTATAGTCT...CCAAGGGAGGTATTGAAGGCCTATGTCAGA | 11037 | Toshiba |
|       |  |       |         |
| 10999 | TGATATCTTTATAGTCTCTCCCAAGGGAGGTATTGAAGGCCTATGTCAGA | 11048 | Greer   |

I

|       |  |       |         |
|-------|--|-------|---------|
| 13938 | ACAGATATAATTCTTCACTCTACTTTAACTGCTCCTTATGATAATTCAGA | 13987 | Toshiba |
|       |  |       |         |
| 13949 | ACAGATATAATTCTTCACTCTACTTTAACTGCTCCTTATGATAATTCAG. | 13997 | Greer   |

J

|       |   |       |         |
|-------|---|-------|---------|
| 13988 | AAACTCTAACAAAGTTCGATTTATCCCTTTTCGACATCTTTCCACATCCAG | 14037 | Toshiba |
|       |   |       |         |
| 13998 | AAACTCTAACAAAGTTCGATTTATCCCTT..GACATCTTTCCACATCCAG  | 14045 | Greer   |

FIGURE 6

A. Site of insertion of oligonucleotides at an EcoRV restriction site in the L polymerase coding sequence

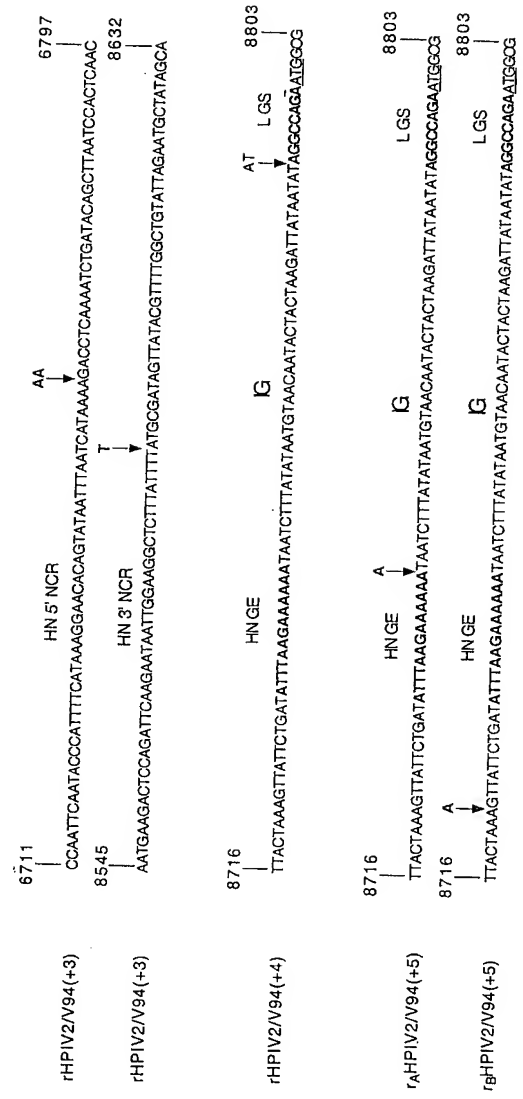
EcoRV ↓  
 GAT AIC GAG AGG GGT ATC GAT GGC GAA GAA TTA TGA CAA CAG TGA  
 HP1V2 nt 15554 ↑  
 end of L coding region ↑

B.

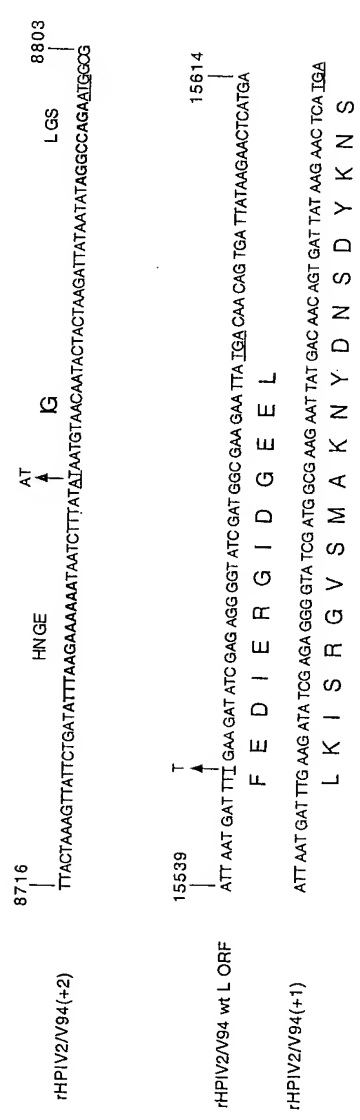
| Designation of recovered virus | Oligonucleotide inserted into EcoRV site:              | Size of insert | (polyhexameric length; length of cDNA) |
|--------------------------------|--|----------------|--|
| rHP1V2/V94 (+6)                | <u>ATTGAGAGGGGTATCGATGGCGAAGAATTATGACAACAGTGA</u>      | +42 nts        | (6n ; 15696 nts)                       |
| rHP1V2/V94 (+1)                | <u>ATTGAGAGGGGTATCGATGGCGAAGAATTATGACAACAGTGAT</u>     | +43 nts        | (6n + 1; 15697 nts)                    |
| rHP1V2/V94 (+2)                | <u>ATTGAGAGGGGTATCGATGGCGAAGAATTATGACAACAGTGATA</u>    | +44 nts        | (6n + 2; 15698 nts)                    |
| rHP1V2/V94 (+3)                | <u>ATTGAGAGGGGTATCGATGGCGAAGAATTATGACAACAGTGATAA</u>   | +45 nts        | (6n + 3; 15699 nts)                    |
| rHP1V2/V94 (+4)                | <u>ATTGAGAGGGGTATCGATGGCGAAGAATTATGACAACAGTGATAAC</u>  | +46 nts        | (6n + 4; 15700 nts)                    |
| rHP1V2/V94 (+5)                | <u>ATTGAGAGGGGTATCGATGGCGAAGAATTATGACAACAGTGATAACT</u> | +47 nts        | (6n + 5; 15701 nts)                    |

FIGURE 8

A Genome length modified by nt insertion



B Genome length modified by nt deletion



Human Parainfluenza Virus Type 2 Strain V94 antigenomic sense cDNA Sequence Range: 1 to 15654

|            |            |            |            |             |            |            |             |             |             |
|------------|------------|------------|------------|-------------|------------|------------|-------------|-------------|-------------|
| 10         | 20         | 30         | 40         | 50          | 60         | 70         | 80          | 90          | 100         |
| ACCAAGGGGA | GAATCAGATG | GCATCGTTAT | ATGACGAATT | GCAAAAAAGAT | TACGTAGGTC | CGGAACCACT | AGATTCCGGT  | GCCGGTAACG  | ATCTCAGTTT  |
| 110        | 120        | 130        | 140        | 150         | 160        | 170        | 180         | 190         | 200         |
| TATACTATCT | GATCATTCTT | TATCTCTACT | AAGGATATTT | CTAATCTAAG  | GTTCAAAATG | TCAAGTGTCT | TAAAGACATT  | TGAAAGATT   | ACTATACAAC  |
| 210        | 220        | 230        | 240        | 250         | 260        | 270        | 280         | 290         | 300         |
| AGGAGCTTCA | GGAGCAATCT | GAAGACACTC | CAATACCTCT | TGAAACAATC  | AGACCTACAA | TCAGAGTATT | TGTCATCAAT  | AATAATGATC  | CTATTGTAAG  |
| 310        | 320        | 330        | 340        | 350         | 360        | 370        | 380         | 390         | 400         |
| ATCTAGACTT | TTATTCTTTA | ATCTACGAAT | TATTATGAGT | AACACTGCCA  | GAGAGGGACA | TAGAGCTGGT | GCTCTCCTCA  | GTCTTTTATC  | ACTACCTTCT  |
| 410        | 420        | 430        | 440        | 450         | 460        | 470        | 480         | 490         | 500         |
| GCAGCTATGA | GTAATCATAT | CAAACTAGCC | ATGCATTAC  | CAGAAGCCAG  | CATAGATAGA | GTAGAAATAA | CAGGGTTTGA  | GAATAATTCA  | TTCCGAGTTA  |
| 510        | 520        | 530        | 540        | 550         | 560        | 570        | 580         | 590         | 600         |
| TTCCAGATGC | TCGATCAACT | ATGTCCAGAG | GAGAAGTGCT | GGCCTTCGAA  | GCATTAGCTG | AGGACATTCC | TGATACCCCT  | AATCACCAAA  | CTCCATTTGT  |
| 610        | 620        | 630        | 640        | 650         | 660        | 670        | 680         | 690         | 700         |
| AAATAATGAT | GTGGAAGATG | ACATATTTGA | TGAAACAGAG | AAATTCCTGG  | ATGTTTGCTA | TAGTGTACTT | ATGCAGGCAT  | GGATAGTAAC  | ATGCAAGTGC  |
| 710        | 720        | 730        | 740        | 750         | 760        | 770        | 780         | 790         | 800         |
| ATGACTGCTC | CTGATCAACC | ACCAGTATCA | GTAGCAAAAG | GGATGGCTAA  | ATATCAACAA | CAAGGGAGAA | TCAATGCTAG  | ATATGTACTA  | CAACCTGAAG  |
| 810        | 820        | 830        | 840        | 850         | 860        | 870        | 880         | 890         | 900         |
| CACAAAGACT | AATTCAGAAT | GCCATCCGCA | AGTCAATGGT | AGTAAGGCAT  | TTCATGACCT | ATGAGCTTCA | ACTTTCACAA  | TCAAGATCTT  | TGCTAGCGAA  |
| 910        | 920        | 930        | 940        | 950         | 960        | 970        | 980         | 990         | 1000        |
| CCGTTATTAT | GCCATGGTGG | GAGACATTGG | CAAGTATATT | GAACACAGCG  | GAATGGGAGG | GTTTTCTCTA | ACACTTAAAT  | ATGGACTTGG  | AACAAGATGG  |
| 1010       | 1020       | 1030       | 1040       | 1050        | 1060       | 1070       | 1080        | 1090        | 1100        |
| CCTACATTGG | CTCTTGACAG | ATTCTCTGGG | GAACCTCAGA | AATTAAGGCG  | TCTCATGCTA | CATTATCAGA | GTCTAGGACC  | CATGGCCAAG  | TACATGGCTC  |
| 1110       | 1120       | 1130       | 1140       | 1150        | 1160       | 1170       | 1180        | 1190        | 1200        |
| TATTAGAATC | ACCAAAGCTG | ATGGATTGTT | TCCCATCTGA | ATATCCATTA  | GTTTATAGCT | ATGCAATGGG | TATTGGAACT  | GTCTTGTATA  | CAACATGAG   |
| 1210       | 1220       | 1230       | 1240       | 1250        | 1260       | 1270       | 1280        | 1290        | 1300        |
| AAACTATGCA | TATGGTAGAT | CATATCTAAA | TCCACAATAT | TTTCAGCTAG  | GGGTAGAAAC | AGCAAGGAAA | CAGCAAGGAG  | CTGTTGACAA  | CAGGACAGCA  |
| 1310       | 1320       | 1330       | 1340       | 1350        | 1360       | 1370       | 1380        | 1390        | 1400        |
| GAGGACCTCG | GCATGACTGC | TGCAGATAAA | GCAGACCTCA | CTGCAACCAT  | ATCAAAGCTA | TCTTTATCCC | AATTACCTAG  | GGGTAGACAA  | CCAATATCCG  |
| 1410       | 1420       | 1430       | 1440       | 1450        | 1460       | 1470       | 1480        | 1490        | 1500        |
| ACCCATTGCG | TGGAGCAAAT | GACAGAGAAA | CAGGAGGACA | AGCAACTGAT  | ACACCTGTGT | ATAACTTCAA | TCCAATCAAT  | AATCGGAGGT  | ATGACAACTA  |
| 1510       | 1520       | 1530       | 1540       | 1550        | 1560       | 1570       | 1580        | 1590        | 1600        |
| TGACAGTGAT | AGTGAGGACA | GAATTGACAA | CGATCAAGAT | CAGGCTATCA  | GAGAGAACAG | AGGAGAACCT | GGACAACCAA  | ACAACCAGAC  | AAGCGAAAAAC |
| 1610       | 1620       | 1630       | 1640       | 1650        | 1660       | 1670       | 1680        | 1690        | 1700        |
| CAGCAGAGAC | TCAATCTCCC | TGTACCGCAA | AGAACATCAG | GTATGAGTAG  | TGAAGAGTTC | CAACATTCAA | TGAATCAGTA  | CATCCGTGCT  | ATGCATGAGC  |
| 1710       | 1720       | 1730       | 1740       | 1750        | 1760       | 1770       | 1780        | 1790        | 1800        |
| AATACAGAGG | CTCCCAGGAT | GATGATGCCA | ATGATGCCAC | AGATGGGAAT  | GACATTTCAC | TTGAGCTAGT | TGGAGATTTT  | GATTCCCTAAC | TCTCACTTTC  |
| 1810       | 1820       | 1830       | 1840       | 1850        | 1860       | 1870       | 1880        | 1890        | 1900        |
| ACATAACCA  | ACATACACAT | CCACACCACC | CAGAGACATA | GCTACCATCC  | ACACACTCAC | CCAGACAAAT | CAAACTAGAT  | TCAAATCATT  | CGGAAACAAT  |
| 1910       | 1920       | 1930       | 1940       | 1950        | 1960       | 1970       | 1980        | 1990        | 2000        |
| TCTCCTAGAA | TTTAAGAAAA | AAACATAGGC | CCGGACGGGT | TAGAGATCCG  | GTGCTCGTCT | GTGGCCAGAC | AACCTCCACA  | CCAGAGCCAC  | ACAATCATGG  |
| 2010       | 2020       | 2030       | 2040       | 2050        | 2060       | 2070       | 2080        | 2090        | 2100        |
| CCGAGGAACC | AACATACACC | ACTGAGCAAG | TTGATGAATT | AATCCATGCT  | GGACTAGGAA | CAGTAGATTT | CTTCTATCT   | AGACCCATAG  | ATGCTCAGTC  |
| 2110       | 2120       | 2130       | 2140       | 2150        | 2160       | 2170       | 2180        | 2190        | 2200        |
| TTCTTTAGGT | AAAGGCAGCA | TCCCACCAGG | TGTCACGGCT | GTTCTAACCA  | ATGCAGCAGA | GGCAAAATCC | AAACCAAGTT  | CTGCTGGTCC  | AGTAAAACCC  |
| 2210       | 2220       | 2230       | 2240       | 2250        | 2260       | 2270       | 2280        | 2290        | 2300        |
| AGACGGAAGA | AAGTGATCAG | CAATACCACT | CCATACACTA | TTGCAGACAA  | CATCCACCT  | GAGAAGCTAC | CGATCAACAC  | TCCAATACCC  | AATCCATTAC  |
| 2310       | 2320       | 2330       | 2340       | 2350        | 2360       | 2370       | 2380        | 2390        | 2400        |
| TTCCACTGGC | ACGCCCTCAC | GGAAAGATGA | CAGACATTGA | CATTGTCACT  | GGGAACATTA | CAGAAGGATC | ATACAAAGGT  | GTGGAGCTTG  | CCAAATTAGG  |
| 2410       | 2420       | 2430       | 2440       | 2450        | 2460       | 2470       | 2480        | 2490        | 2500        |
| GAAGCAAACA | CTACTCACAA | GGTTCACCTC | GAATGAGCCA | GTCTCTCTAG  | CTGGATCCCG | CCAAGACCCC | AACTTTAAGA  | GGGGGGGAGC  | TAATAGAGAA  |
| 2510       | 2520       | 2530       | 2540       | 2550        | 2560       | 2570       | 2580        | 2590        | 2600        |
| AGAGCAAGAG | GCAACCATAG | GAGAGAATGG | AGTATTGCAT | GGGTGCGAGA  | TCAGGTCAAA | GTCTTCGAGT | GGTGTAAATCC | CAGGTGTGCC  | CCAGTTCACGG |
| 2610       | 2620       | 2630       | 2640       | 2650        | 2660       | 2670       | 2680        | 2690        | 2700        |
| CTTCAGCTCG | CAAGTTCACC | TGCACATGTG | GATCCTGCCC | CAGCATCTGC  | GGAGAATGTG | AAGGAGATCA | TTGAGCTCTT  | AAAGGGGCTT  | GATCTTCGCC  |
| 2710       | 2720       | 2730       | 2740       | 2750        | 2760       | 2770       | 2780        | 2790        | 2800        |
| TTCACTGCTG | AGAAGGGAAA | GTAGATAAAA | TTCTTGCAAC | CTCTGCAACT  | ATAATCAATC | TTAAAAATGA | AATGACTAGT  | CTTAAGGCGA  | GCGTTGCAAC  |
| 2810       | 2820       | 2830       | 2840       | 2850        | 2860       | 2870       | 2880        | 2890        | 2900        |
| TGTGGAAGGT | ATGATAACAA | CAATTAATAA | CATGGATCCC | AGTACACCAA  | CCAATGTCC  | TGTAGAGGAG | ATCAGAAAGA  | GTTTACACAA  | TGTTCCAGTA  |

FIGURE 9A

```
2910      2920      2930      2940      2950      2960      2970      2980      2990      3000
GTAATTGCTG GTCCGACTAG TGGAGGCTTC ACAGCCGAAG GCAGTGACAT GATTTC AATG GATGAAGTAG CTAGGCCTAC ACTCTCATCA AAAAAAAGA

3010      3020      3030      3040      3050      3060      3070      3080      3090      3100
TCACACGAAA GCCTGAATCC AAGAAAGATT TAACAGGCAT AAAACTAACC CTGATGCAGC TTGCAAATGA CTGCATCTCG CGTCCAGATA CCAAGACTGA

3110      3120      3130      3140      3150      3160      3170      3180      3190      3200
GTTTGTGACT AAGATTCAAG CAGCAACCAC AGAATCACAG CTC AAGCAA TCAAACGGTC AATAATACGC TCTGCAATAT AAAATGCGGT GCAATCACAC

3210      3220      3230      3240      3250      3260      3270      3280      3290      3300
AAGAGACATT CAACATGCAT CCGATCAAGA TCCAAACTCC TTCCATCCGA AAACACACTC ACCACTGTCA ACACCAAGAA ACAACTACAG CCGAACCATG

3310      3320      3330      3340      3350      3360      3370      3380      3390      3400
CTCAACCAAA AGACCCAAAC AACATCTCAA ATCGACAGAA GGCTAGACAT GATAAATTTA ATAAAAAATT AAAAGAAGTT AAGTAAATTT TAAAGAACAC

3410      3420      3430      3440      3450      3460      3470      3480      3490      3500
AATAGAGAAA ACCTAGGTCC GAAAGCTTGC CTTTCAGACA GATCCCAAAA TCATAGTTCA AACTTCAAAC ACAGCAGCAG ACATGCCTAT AATATCATT A

3510      3520      3530      3540      3550      3560      3570      3580      3590      3600
CCAGCAGATC CAACTTCACC CAGTCAATCC CTTACTCCGT TTCCAATACA ACTTGATACC AAAGATGGCA AGGCAGGGAA ACTCTTTAAA CAGATTAGAA

3610      3620      3630      3640      3650      3660      3670      3680      3690      3700
TTAGGTATCT AAATGAACCT AACTCTCGTC ATACACCAAT AACTTTTCATC AATAGGTATG GATTGTGTTA TGCTCGAGAC ACTTCAGGAG GCATTCACAG

3710      3720      3730      3740      3750      3760      3770      3780      3790      3800
CGAGATCAGC AGTGACCTAG CTGCAGGGTC CATAACGGCA TGCATGATGA CACTAGGTCC TGGTCCAAAT ATTCAGAAAT CAAATCTAGT GCTAAGATCC

3810      3820      3830      3840      3850      3860      3870      3880      3890      3900
CTGAATGAAT TCTACGTAAA AGTCAAGAAG ACATCAAGCC AGAGGGAGGA AGCAGTGTTT GAATTAGTTA ACATTCCAAC CTTATTGAGA GAACATGCTC

3910      3920      3930      3940      3950      3960      3970      3980      3990      4000
TTTGCAAACG CAAAACGTTA GTATGCTCTG CAGAAAAATT CCTCAAGAAC CCATCAAAGC TACAAGCTGG ATTTGAATAT GTATACATCC CAACTTTTGT

4010      4020      4030      4040      4050      4060      4070      4080      4090      4100
CTCCATTACA TACTCACCAC GAAATCTGAA TTACCAAGTT GCCAGACCTA TCCTTAAGTT CAGATCACGC TTTGTGTATA GCATTCATTT GGAATTAATC

4110      4120      4130      4140      4150      4160      4170      4180      4190      4200
CTGAGATTGC TATGCAAAATC TGACTCCCCT TTGATGAAAT CTTATATATG AGATCGAACA GGTCGAGGAT GCCTCGCATC AGTCTGGATC CACGTATGTA

4210      4220      4230      4240      4250      4260      4270      4280      4290      4300
ACATTCTGAA AAACAAAAGC ATCAAGCAAC AAGGCAGAGA ATCATATTTT ATAGCTAAGT GCATGAGTAT GCAGCTGCAG GTGTCCATTG CAGATCTTTG

4310      4320      4330      4340      4350      4360      4370      4380      4390      4400
GGGACCAACA ATCATAATTA AATCATTGGG TCACATCCCC AAGACTGCAC TTCCTTTTTT CAGCAAAGAC GGGATTGCCT GTCATCCACT ACAAGATGTT

4410      4420      4430      4440      4450      4460      4470      4480      4490      4500
TCCCTTACTC TGACAAAATC ACTGTGGTCA GTGGGATGTG AGATAGAATC TGCCAAGTTG ATACTTCAAG AATCTGATAT TAATGAGTCA ATGGGCCACC

4510      4520      4530      4540      4550      4560      4570      4580      4590      4600
AGGACTTGAT TACTGATAAG ATTGCCATTA GATCAGGTCA ACGGACATTT GAGAGGTCCA AATTCAGCCC ATTCAAAAAA TACGCATCAA TTCCAAACTT

4610      4620      4630      4640      4650      4660      4670      4680      4690      4700
AGAAGCCATC AACTGAATGC TCCAGCATCT AGGAATAGAA CAACAACATA GTCATACCAT TATTGACCAT ACAATAATCA ACAATTTTAG CCAACTGATT

4710      4720      4730      4740      4750      4760      4770      4780      4790      4800
ACTAAGATAT TATCATAGGT CCGAACTGAT CAATCTAACA AAAAAACTAA ACATTCAATA ATAAATCAAA GTTCAGGCCA AATTATCCAG CCATGCATCA

4810      4820      4830      4840      4850      4860      4870      4880      4890      4900
CCTGCATCCA ATGATAGTAT GCATTTTGT TATGTACACT GGAATTGTAG GTTCAGATGC CATTGTCTGA GATCAACTCC TCAATGTAGG GGTCAATTCAA

4910      4920      4930      4940      4950      4960      4970      4980      4990      5000
TCAAAGATAA GATCACTCAT GTACTACACT GATGGTGGCG CTAGCTTTAT TGTGTGAAAA TTACTACCCA ATCTTCCCCC AAGCAATGGA ACATGCAACA

5010      5020      5030      5040      5050      5060      5070      5080      5090      5100
TCACCAGTCT AGATGCATAT AATGTTACCC TATTTAAGTT GCTAACACCC CTGATTGAGA ACCTGAGCAA AATTTCTGCT GTTACAGATA CCAAACCCCG

5110      5120      5130      5140      5150      5160      5170      5180      5190      5200
CCGAGAACGA TTTGCAGGAG TCGTTATTGG GCTTGCTGCA CTAGGAGTAG CTACAGCTGC ACAAATAACC GCAGCTGTAG CAATAGTAAA AGCCAATGCA

5210      5220      5230      5240      5250      5260      5270      5280      5290      5300
AATGCTGCTG CGATAAACAA TCTTGCTACT TCAATTCAAT CCACCAACAA GGCAGTATCC GATGTGATAA CTGCATCAAG AACAAATTGCA ACCGCAGTTC

5310      5320      5330      5340      5350      5360      5370      5380      5390      5400
AAGCGATTCA GGATCACATC AATGGAGCCA TTGTCAACGG GATAACATCT GCATCATGCC GTGCCCATGA TGCATAAATT GGGTCAATAT TAAATTGTGA

5410      5420      5430      5440      5450      5460      5470      5480      5490      5500
TCTCACTGAG CTTACTACAA TATTTCATAA TCAAATAACA AACCTTGCGC TGACACCATC TTCCATCCAA GCTTTAAGAA TCCTCTCTCG TAGCACCTTG

5510      5520      5530      5540      5550      5560      5570      5580      5590      5600
CCAATTGTCA TTGAATCCAA ACTCAACACA AAACCTCAACA CAGCAGAGCT GCTCAGTTCC GGACTGTTAA CTGGTCAAAT AATTTCATTT TCCCCAATGT

5610      5620      5630      5640      5650      5660      5670      5680      5690      5700
ACATGCAAAAT GCTAATTCAA ATCAATGTTT CGACATTAT AATGCAACCC GGTGCGAAGG TAATTGATCT AATTGCTATC TCTGCAAAAC ATAAATTACA

5710      5720      5730      5740      5750      5760      5770      5780      5790      5800
AGAAGTAGTT GTACAAGTTC CTAATAGAAT TCTAGAATAT GCAAATGAAC TACAAAACCTA CCCAGCCAAT GATTGTGTCG TGACACCAAA CTCTGTATTT
```

FIGURE 9B

5810 5820 5830 5840 5850 5860 5870 5880 5890 5900  
TG TAGATACA ATGAGGGTTC CCCGATCCCT GAATCACAAT ATCAATGCTT AAGGGGGAAT CTTAATTCTT GCATTTTAC CCCTATTATC GGGAACTTTC  
5910 5920 5930 5940 5950 5960 5970 5980 5990 6000  
TCAAGCGATT CGCATTTGCC AATGGTGTGC TCTATGCCAA CTGCAAAATCT TTGCTATGTA AGTGTGCCGA CCCTCCCAT GTTGTGTCTC AAGATGACAA  
6010 6020 6030 6040 6050 6060 6070 6080 6090 6100  
CCAAGGCATC AGCATAATTG ATATTAAGAG GTGCTCTGAG ATGATGCTTG ACACTTTTTC ATTTAGGATC ACATCTACAT TCAATGCTAC ATACGTGACA  
6110 6120 6130 6140 6150 6160 6170 6180 6190 6200  
GACTTCTCAA TGATTAATGC AAATATTGTA CATCTAAGTC CTCTAGACTT GTCAAATCAA ATCAATTCAA TAAACAAATC TCTTAAAGT GCTGAGGATT  
6210 6220 6230 6240 6250 6260 6270 6280 6290 6300  
GGATTGCAGA TAGCAACTTC TTCGCTAATC AAGCCAGAAC AGCCAAGACA CTTTATTTCAC TAAGTGCAAT CGCATTAATA CTATCAGTGA TTACTTTGGT  
6310 6320 6330 6340 6350 6360 6370 6380 6390 6400  
TGTTGTGGGA TTGCTGATTG CCTACATCAT CAAGCTGGTT TCTCAAATCC ATCAATTCAG AGCACTAGCT GCTACAACAA TGTTCACAG GGAGAATCCT  
6410 6420 6430 6440 6450 6460 6470 6480 6490 6500  
GCCGTCTTTT CCAAGAACAA TCATGGAAAC ATATATGGGA TATCTTAAGA ATTCTATCAT AAGTCCATAT ATGTCCATGA TTGACCTTTA AGAGCCAACC  
6510 6520 6530 6540 6550 6560 6570 6580 6590 6600  
TCCAATGATT ATCCGTATAA TTCAGATATA ACAATTCAAA AATCAATATT AAGCCTCCAG ATACCAATGA ATATGAATAT ATCTCTTAGA AAACCTGATT  
6610 6620 6630 6640 6650 6660 6670 6680 6690 6700  
ATTATGTGAT AACATAGTAC AATTTAAGAA AAAACCTAAA ATAAGCACGA ACCCTTAAGG TGTCGTAACG TCTCGTGACG CCGGGTTTTCAG TTCAAACATC  
6710 6720 6730 6740 6750 6760 6770 6780 6790 6800  
GACCCCTGAC CCAATTCAAT ACCCATTTTC ATAAAGGAAC ACAGTATAAT TTAATCATAA AAGACCTCAA AACTCTGATAC AGCTTAATCC ACTCAACATA  
6810 6820 6830 6840 6850 6860 6870 6880 6890 6900  
TAATTATAAG ACTAATAATA ATGGAAGATT ACAGCAATCT ATCTCTTAAA TCAATTCTTA AAAGGACATG TAGAATCATT TTCCGAAGTG CCACAATTCT  
6910 6920 6930 6940 6950 6960 6970 6980 6990 7000  
TGGCATATGC ACATTAATTG TGCTATGTTT AAGTATTCTT CATGAGATAA TTCATCTTGA TGTTCCTCTT GGTCTTATGA ATTCTGATGA GTCACAGCAA  
7010 7020 7030 7040 7050 7060 7070 7080 7090 7100  
GGCATTATTC AGCCTATCAT AGAATCATT AAATCATGTA TTGCTTTGGC CAACCAGATT CTATATAATG TTGCAATAGT AATCTCTCTT AAAATTGACA  
7110 7120 7130 7140 7150 7160 7170 7180 7190 7200  
GTATCGAAAC TGTAATACTC TCTGCTTTAA AAGATATGCA CACCGGGAGT ATGTCCATG CCAACTGCAC GCCAGGAAAT CTGCTTCTGC ATGATGCAGC  
7210 7220 7230 7240 7250 7260 7270 7280 7290 7300  
ATACATCAAT GGAATAAACA AATTCCTTGT ACTTGAATCA TACAATGGGA CGCCTAAATA TGGACCTCTC CTAATATATC CCAGCTTTAT CCCCTCAGCA  
7310 7320 7330 7340 7350 7360 7370 7380 7390 7400  
ACATCTCCCC ATGGGTGTAC TAGAATACCA TCATTTTCAC TCATCAAGAC CCATTGGTGT TACACTCACA ATGTAATGCT TGGAGATTGT CTTGATTTC  
7410 7420 7430 7440 7450 7460 7470 7480 7490 7500  
CGGCATCTAA CCAGTATTTA TCAATGGGGA TAATACAACA ATCTGCTGCA GGGTTTCCAA TTTTCAGGAC TATGAAAACC ATTTACCTAA GTGATGGAA  
7510 7520 7530 7540 7550 7560 7570 7580 7590 7600  
CAATCGCAA AGCTGTTCAG TCACTGCTAT ACCAGGAGGT TGTGTCTTGT ATTGCTATGT AGCTACAAGG TCTGAAAAG AAGATTATGC CACGACTGAT  
7610 7620 7630 7640 7650 7660 7670 7680 7690 7700  
CTAGCTGAAC TGAGACTTGC TTCTATTAT TATAATGATA CCTTTATTGA AAGAGTCATA TCTCTTCCAA ATACAACAGG GCAGTGGGCC ACAATCAACC  
7710 7720 7730 7740 7750 7760 7770 7780 7790 7800  
CTGCAGTCGG AAGCGGATC TATCATCTAG GCTTTATCTT ATTTCTGTGA TATGTTGCTC TCATAAATGG GACTACTTCT TACAATGAGC AGTCCTCAGC  
7810 7820 7830 7840 7850 7860 7870 7880 7890 7900  
CTATTTTATC CCAAAACATC CCAACATAAC TTGTGCCGGT AACTCCAGCA AACAGGCTGC AATAGCACGG AGTTCCTATG TCATCCGTTA TCACTCAAAC  
7910 7920 7930 7940 7950 7960 7970 7980 7990 8000  
AGGTTAATTC AGAGTGCTGT TCTTATTGT CCATTGTCTG ACATGCATAC AGAAGAGTGT AATCTAGTTA TGTTTAACA TTCCCAAGTC ATGATGGGTG  
8010 8020 8030 8040 8050 8060 8070 8080 8090 8100  
CAGAAGGTAG GCTCTATGTT ATTGGTAATA ATTTGTATTA TTATCAACGC AGTCTCTCTT GGTGTCTGCT ATCGCTCTTT TACAGGATCA ATACAGATTT  
8110 8120 8130 8140 8150 8160 8170 8180 8190 8200  
TTCTAAAGGA ATTCTCCGA TCATTGAGGC TCAATGGGTA CCGTCCTATC AAGTTCTCTG TCCTGGAGTC ATGCCATGCA ATGCAACAAG TTTTGGCCCT  
8210 8220 8230 8240 8250 8260 8270 8280 8290 8300  
GCTAATTGCA TCACAGGGT GTACGCAGAT GTGTGGCCG TTAATGATCC AGAATCATG TCACGTAATG CTCTGAACCC CAACTATCGA TTGCTGGAG  
8310 8320 8330 8340 8350 8360 8370 8380 8390 8400  
CCTTTCTCAA AAATGAGTCC AACCGAAC TAACCCACATT CTACACTGCA TCGGCTAACT CCCTCTTAAA TACTACCGGA TTCAACAACA CCAATCACAA  
8410 8420 8430 8440 8450 8460 8470 8480 8490 8500  
AGCAGCATAT ACATCTTCAA CCTGCTTTAA AAACACTGGA ACCCAAAAAA TTTATTGTTT AATAATAATT GAAATGGGCT CATCTCTTTT AGGGGAGTTC  
8510 8520 8530 8540 8550 8560 8570 8580 8590 8600  
CAAATAATAC CATTTTTAA GGAACATAATG CTTTAATCCT ATTGAATGAA GACTCCAGAT TCAAGAATAA TTGGAAGGCT CTTTATTTTA TGCGATAGTT  
8610 8620 8630 8640 8650 8660 8670 8680 8690 8700  
ATACGTTTTG GCTGTATTAG AATGCTATAG CATTCTGCTG TTTTCCCAT ATGGAAAAAT CCTCAACAC CAACTTAGGT TCAATTTTCT CATCATTTAC

FIGURE 9C

8710 8720 8730 8740 8750 8760 8770 8780 8790 8800  
TGTTGTAATT CAATCTTACT AAAGTTATTC TGATATTTAA GAAAAAATAA TCTTTATATA ATGTAACAAT ACTACTAAGA TTATAATATA GGCCAGAATG  
8810 8820 8830 8840 8850 8860 8870 8880 8890 8900  
GCGGCTCTTT CTGAGATACT CCTTCCTGAA GTCCATTGGA ACTCACC AAT AGTCAACAC AAACATCATAT ACTACTTATT ACTAGGGCAC TTCCCGCATG  
8910 8920 8930 8940 8950 8960 8970 8980 8990 9000  
ATCTTGACAT TTCTGAAATA AGCCCCCTTC ACAATAATGA TTGGGATCAG ATTGCCAGAG AAGAATCCAA TCTTGCTGAA CGACTCGGAG TAGCTAAATC  
9010 9020 9030 9040 9050 9060 9070 9080 9090 9100  
TGAATTAATT AAACGTGTGC CCGCATTTAG AGCAACCAGA TGGCGTAGTC ATGCAGCCGT CCTTATATGG CCTTCTTGTA TACCATTCTT TGTAAATTC  
9110 9120 9130 9140 9150 9160 9170 9180 9190 9200  
CTACCCCATC CTAAGCTTCA ACCAATAGAA CAATGGTACA AGTTGATCAA TGCTTCATGC AATACTATAT CTGACTCAAT TGATAGATGT ATGGAGAATA  
9210 9220 9230 9240 9250 9260 9270 9280 9290 9300  
TTTCTATTAA GCTTACTGGG AAAACAATC TATTCTCTCG ATCCAGAGGA ACTGCAGGCG CAGGTAAGAA CAGTAAATC ACCCTCAATG ATATCCAATC  
9310 9320 9330 9340 9350 9360 9370 9380 9390 9400  
TATTGGGAA TCAACAAAT GGCAGCCTAA TGTATCTTTA TGGCTTACAA TTAATAACCA AATGCGACAA CTTATAATGC ATCAAAGTTC TCGTCAGCCA  
9410 9420 9430 9440 9450 9460 9470 9480 9490 9500  
ACTGATTAG TTCACATGT TGACACAGA TCTGGTCTAA TAGTTATCAC CCCTGAACCT GTTATTGTCT TTGATCGGTT GAATAATGTT TTAATGTATT  
9510 9520 9530 9540 9550 9560 9570 9580 9590 9600  
TTACATTGA GATGACTTTA ATGGTAAGTG ACATGTTTGA GGGACGGATG AATGTTGCCG CGCTCTGCAC TATTAGTCAT TACTTATCAC CACTAGGGCC  
9610 9620 9630 9640 9650 9660 9670 9680 9690 9700  
AAGGATAGAT AGATTGTTTT CTATTGTAGA TGAATTAGCA CAACTATTGG GTGACACTGT ATATAAAATT ATGCATCTC TTGAATCTTT AGTATATGGG  
9710 9720 9730 9740 9750 9760 9770 9780 9790 9800  
TGCTACAAC TTAAAGATCC AGTGGTTGAA TTAACAGGAT CATTTCATTC CTTTATTACG CAAGAGATTA TAGATATCCT AATTGGGTCA AAAGCCCTTG  
9810 9820 9830 9840 9850 9860 9870 9880 9890 9900  
ATAAGGATGA ATCAATAACT GTCACATCAC AATTGCTAGA TATATTTTCC AACCTTTCTC CAGATTTAAT CGCTGAGATG TTGTGTCTCA TGAGACTTTG  
9910 9920 9930 9940 9950 9960 9970 9980 9990 10000  
GGGTATCCC ACTCTTACTG CTGCGCAAGC TGCAGGTAAG GTGAGAGAA CTATGTGTGC AGGTAAGTTA CTTGATTTCC CTACAATAAT GAAACTCTTT  
10010 10020 10030 10040 10050 10060 10070 10080 10090 10100  
GCTTTTTTCC ACACAATTTT AATCAATGGT TATCGTAGAA AGAAGAATGG AATGTGGCCT CCACCTATAC TTCCTAAAAA TGCAATCAAAA AGCTTAATAG  
10110 10120 10130 10140 10150 10160 10170 10180 10190 10200  
AGTTTCAACA TGATAATGCT GAAATATCTT ATGAGTATAC ACTCAAGCAT TGGAAAGAAA TCTCTCTCAT AGAATTTAGA AAGTGCTTTG ACTTTGATCC  
10210 10220 10230 10240 10250 10260 10270 10280 10290 10300  
TGGTGAGGAG CTAAGCATTT TTATGAAAGA CAAGGCAATA AGTGCTCCAA AAAGTGATTG GATGAGTGTA TTCCGTAGAA GTCTAATAAA ACAACGACAT  
10310 10320 10330 10340 10350 10360 10370 10380 10390 10400  
CAGAGACATC ATATTCCAT GCCCATATCA TTAAACAGAC GTCTATTACT CAATTTCTTA GAAGATGACA GTTTTGATCC AGTTGCTGAG CTTCATATAG  
10410 10420 10430 10440 10450 10460 10470 10480 10490 10500  
TTACCATGGG TGAATATCTC CGAGATGACA CATTTTGTGC ATCTTACTCA TTAAGAGAGA AAGAAATAAA ACCAGATGGA AGGATATTTG CTAAGCTTAC  
10510 10520 10530 10540 10550 10560 10570 10580 10590 10600  
TAATAGAAAG CGGTCTTGTC AAGTAATGTC GGAAGCAATT CTTGCAAAATC ACGCAGGTAC TCTAATGAAG GAAACGGAG TTGCTCTGAA TCAATTATCT  
10610 10620 10630 10640 10650 10660 10670 10680 10690 10700  
CTGACTAAAT CATTGCTTAC TATGAGTCAA ATTGGCATAA TATCAGAAAA AGCAAGAGAGA TATACCCGAG ATAACATCTC ATCTCAAGGT TTCCATACAA  
10710 10720 10730 10740 10750 10760 10770 10780 10790 10800  
TCAAGACTGA CTCAAAAAAT AAGAAGAAAA GCAAAATGTC ATCATCATAC CTCACAGATC CTGATGATAC ATTTGAACCT AGTGCATGTT TTATAACTAC  
10810 10820 10830 10840 10850 10860 10870 10880 10890 10900  
TGATCTTGCT AAATACTGTC TTCAATGGAG ATATCAGACC ATAATCCATT TTGCTCGAAC ATTAACAGAGA ATGTATGGAG TTCCACATTT ATTGAATGG  
10910 10920 10930 10940 10950 10960 10970 10980 10990 11000  
ATTCATCTTC GTTTGATTAG ATCTACATTA TATGTTGGTG ATCCATTCAA TCCTCTGCCC ACAACTGATG CCTTCGATCT AGATAAGTA TTAATGGTG  
11010 11020 11030 11040 11050 11060 11070 11080 11090 11100  
ATATCTTTAT AGTCTCTCCC AAGGGAGGTA TTGAAGGCCT ATGTCAGAAA ATGTGGACAA TGATCTCTAT TTCTGTGATC ATCCTTTCTT CAGCCGAATC  
11110 11120 11130 11140 11150 11160 11170 11180 11190 11200  
CAAAACAAGA GTAATGAGCA TGGTTCAAGG AGATAATCAG GCGATTGCGC TTACAACAAG AGTTCCTAGA TCATTGCTCA GTGTTCAAGAA AAAGGAGTTA  
11210 11220 11230 11240 11250 11260 11270 11280 11290 11300  
GCCTACGAG CAAGCAAGTT ATTCTTTGAA AGACTTAGGG CAAATAATTA TGGTTTGGGT CATCAACTAA AGGCTCAAGA GACTATAATA AGTTCCACGT  
11310 11320 11330 11340 11350 11360 11370 11380 11390 11400  
TCTTCATATA TAGTAAACGG GTATTCTATC AAGGACGTAT ACTAACACAG GCACTTAAAA ATGCTAGCAA GTTATGTCTT ACTGCAGATG TATTAGGTGA  
11410 11420 11430 11440 11450 11460 11470 11480 11490 11500  
ATGTACTCAG GCTTCTCTGCT CAAATCTGTC TACTACAATC ATGAGATTAA CAGAAAATGG GGTGAGAAA GATACATGTT ATAAGCTTAA TATTATCA  
11510 11520 11530 11540 11550 11560 11570 11580 11590 11600  
TCTATTCGTC AACTCACATA TGATCTAATA TTTCCCAAT ACTCCATACC AGGTGAAACA ATAAGTGAAA TTTCTTACA GCATCCAGA TTAATCTCAC

FIGURE 9D

11610 11620 11630 11640 11650 11660 11670 11680 11690 11700  
GTATTGTTCT GCTCCCTTCA CAGCTAGGTG GTCTTAATTA CCTCGCATGT AGCAGATTAT TTAACCGCAA TATCGGAGAT CCCCTTGGTA CAGCCGTGGC  
11710 11720 11730 11740 11750 11760 11770 11780 11790 11800  
AGACCTCAAG AGGTTAAATTA AATGTGGTGC TCTTGAATCA TGGATACTGT ACAATTTACT GGCAAGAAAA CCAGGGGAAAG GTTCATGGGC CACTTTAGCA  
11810 11820 11830 11840 11850 11860 11870 11880 11890 11900  
GCCGATCCAT ACTCATTGAA TCAAGAATAT CTTTATCCTC CTACTACTAT ACTTAAAGA CATACTCAA ATACTTTAAT GGAGATATGT CGGAATCCTA  
11910 11920 11930 11940 11950 11960 11970 11980 11990 12000  
TGTAAAGGG AGTTTTTACA GATAATGCAA AAGAGGAGGA AAATCTCCTT GCAAAATTTC TTCTTGATCG TGATATAGTA TTGCCAAGAG TCGCACACAT  
12010 12020 12030 12040 12050 12060 12070 12080 12090 12100  
TATAATAGAT CAATCCAGCA TTGGAAGGAA GAAACAGATA CAAGGGTTTT TTGACACCCAC AAGGACCATA ATGAGACGAT CATTGAGAT CAAACCACTC  
12110 12120 12130 12140 12150 12160 12170 12180 12190 12200  
TCAACTAGA AGACACTTTC AGTCATAGAA TATAATACTA ATTATTATC TTATAACTAC CCTGTCATAC TTAATCCTTT ACCTATTCTT GGATATTTAA  
12210 12220 12230 12240 12250 12260 12270 12280 12290 12300  
ATTATATTAC TGACCAAAT TGCAGTATTG ATATATCTAG AAGTTTAAAGA AAATTATCAT GGTCTTCTTT ATTGAATGGA AGAAGCTTTAG AAGGATTAGA  
12310 12320 12330 12340 12350 12360 12370 12380 12390 12400  
AACTCCAGAT CCAATTGAAG TTGTCAATGG TTCCTTGATT GTAGGTACAG GAGATTGTGA CTTTGTATG CAGGGTGACG ATAAATTCAC TTGGTTCTTT  
12410 12420 12430 12440 12450 12460 12470 12480 12490 12500  
TTACCTATGG GGATAATTAT TGATGGAAAT CCTGAAACTA ATCCACCCAT CAGAGTTCCA TACATTGGGT CTAGAACAGA GGAAAGAAGA GTTGCAATCAA  
12510 12520 12530 12540 12550 12560 12570 12580 12590 12600  
TGGCATATAT TAAAGGTGCC ACACACAGTT TGAAGGCTGC TCTTAGAGGC GCAGGGGTAT ACATTGGGGC ATTCGGGAGT ACAGTAGTGA ACTGGAAATGA  
12610 12620 12630 12640 12650 12660 12670 12680 12690 12700  
TGCACCTGAT ATCGCAAATA CTAGGGTTAA GATATCCCTA GAGCAACTTC AGACTCTTAC ACCTCTTCCT ACATCTGCAA ACATTACACA TCGTTTAGAT  
12710 12720 12730 12740 12750 12760 12770 12780 12790 12800  
GATGGAGCCA CAACACTTAA ATTCACCTCA GCTAGTTTCT ATGCATTTC TAGTTATACT CATATATCAA ATGATCAACA ATATTAGAA ATAGATCAGA  
12810 12820 12830 12840 12850 12860 12870 12880 12890 12900  
GAGTAGTCGA TTCCAATATT ATTTATCAAC AATTAATGAT AACAGGGCTT GGGATCAATTG AGACCTACCA TAACCCACCT ATCAGGACCT CTACACAGGA  
12910 12920 12930 12940 12950 12960 12970 12980 12990 13000  
AATCACCCTC CATTTCGACA CTAGCTCATC TTGTTGTGTT AGAAGGTGAG ATGTTTGCTT TATATGTGAG AGCAATGGAG AGGTTCCCTCA GATCACTGTT  
13010 13020 13030 13040 13050 13060 13070 13080 13090 13100  
CCCTACACTA ATTCATTGT ATATGATCCT GATCCACTAG CAGATTATGA GATTGCACAT CTAGATTATC TCTCCTACCA AGCTAAATTT GGAAGTACAG  
13110 13120 13130 13140 13150 13160 13170 13180 13190 13200  
ATTACTACTC ACTTACTGAT AAAATTGATC TATTGGCACA TTAACTGCA AAACAAATGA TAACTCAAT AATTGGGTGA GATGAAACAG TATCAATTGT  
13210 13220 13230 13240 13250 13260 13270 13280 13290 13300  
CAATGATGCG GTTATCTTAT CTGATTATAC TAATAACTGG ATTAGTGAAT GTTCTTATAC TAAGATAGAT TTAGTTTTTA AATTAATGGC ATGGAATTTT  
13310 13320 13330 13340 13350 13360 13370 13380 13390 13400  
CTTCTTGAGC TTGCATTCCA GATGTACTAC CTAAGAATAT CATCTGGAC AAATATATTT GACTATACCTT ACATGACTTT ACGCAGGATA CCCGGAAGT  
13410 13420 13430 13440 13450 13460 13470 13480 13490 13500  
CTCTAAATAA TATTGCAGCT ACTATTAGCC ACCCAAATTT ATTAAGACGT GCAATGAATC TTGATATTAT CACTCCTATA CATGCACCGT ATTTGGCTTC  
13510 13520 13530 13540 13550 13560 13570 13580 13590 13600  
ATTAGATTAT GTCAAATTA GTATTGATGC AATTCAGTGG GGGGTTAAAC AAGTCTTGC TGATTATCA AATGGAATTG ATCTTGAAAT CTTGATTCTT  
13610 13620 13630 13640 13650 13660 13670 13680 13690 13700  
TCAGAGGATT CAATGGAAAT TAGTGATAGG GCAATGAATC TCATTGCTAG AAACTAACT CTCCTTGCAC TTGTTAAAGG TGAGAAGTAT ACATTTCCAA  
13710 13720 13730 13740 13750 13760 13770 13780 13790 13800  
AAATTAAGG GATGCCACCA GAGGAAAAGT GTTTAGTCTT AACTGAATAC CTAGCAATGT GTTATCAGAA TACTCACCAC TTAGATCCAG ATCTTCAAAA  
13810 13820 13830 13840 13850 13860 13870 13880 13890 13900  
GTATTTATAT AATCTAATA ATCCAAAATT GACTGCATTT CCCAGTAACA ACTTCTACTT AACAAGGAAA ATCCTTAATC AAATTAGAGA ATCAGACGAA  
13910 13920 13930 13940 13950 13960 13970 13980 13990 14000  
GGACAATATA TTATCACCTC ATATTATGAA TCCTTCGAAC AATTAGAAAC AGATATAATT CTCTACTCTA CTTTAACTGC TCCTTATGAT AATTCAGAAA  
14010 14020 14030 14040 14050 14060 14070 14080 14090 14100  
CTCTAACAAA GTTTGATTTA TCCCTTGACA TCTTCCACA TCCAGAATCT CTCGAGAAAT ATCCTCTTCC AGTTGATCAT GACTCTCAAT CTGCAATTTT  
14110 14120 14130 14140 14150 14160 14170 14180 14190 14200  
AACACTAATT CCAGGCCCTC CCTCTCATCA TGTATTACGA CCACTAGGAG GTGTCATCTAC AGCTTGGTAT AAAGGGATAA GTTATTGCAG ATACCTGGAA  
14210 14220 14230 14240 14250 14260 14270 14280 14290 14300  
ACGCAAAAGA TACAGACTGG TGATCATCTT TATTTAGCTG AAGGAAGCGG TGCTTCAATG TCACTTCTAG AACTCCTATT TCCAGGAGAT ACTGCTTATT  
14310 14320 14330 14340 14350 14360 14370 14380 14390 14400  
ATAATAGTCT TTTTAGTAGT GGAGAGAATC CTCCACAGAG AAATTATGCT CCTCTTCCAA CTCAATTTGT ACAGAGTGTT CCATATAAAT TGTGGCAAGC  
14410 14420 14430 14440 14450 14460 14470 14480 14490 14500  
TGATCTTGCT GATGATAGTA ACTTAATAAA AGATTTTGTC CCATTATGGA ATGGAACCGG AGCAGTTACA GACTTATCGA CAAAGGATGC AGTTGCATTC

FIGURE 9E

|            |            |            |            |            |            |            |            |            |            |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 14510      | 14520      | 14530      | 14540      | 14550      | 14560      | 14570      | 14580      | 14590      | 14600      |
| ATAATACATA | AAGTAGGAGC | GGAGAAAGCA | TCCCTTGTTT | ATATAGATCT | CGAATCGACT | GCTAATATAA | ATCAGCAAAC | TCTGTCCAGA | TCCCAGATT  |
| 14610      | 14620      | 14630      | 14640      | 14650      | 14660      | 14670      | 14680      | 14690      | 14700      |
| ATTCGTTAAT | TATAGCAACT | ACTGTTCTTA | AGAGGGGTGG | GATATTAGTT | TACAAAACAT | CATGGCTTCC | GTTTCTTAGG | TTTAGTCAAC | TAGCAAGCCT |
| 14710      | 14720      | 14730      | 14740      | 14750      | 14760      | 14770      | 14780      | 14790      | 14800      |
| ACTTTGGTGC | TTTTTTGACC | GGATCCATCT | AATACGTAGT | AGTTATTCTG | ATCCTCACAG | TCATGAGGTT | TATCTTGTAT | GTAGACTTGC | TGCGGATTTT |
| 14810      | 14820      | 14830      | 14840      | 14850      | 14860      | 14870      | 14880      | 14890      | 14900      |
| AGAACTATCG | GTTTCAGTGC | AGCTCTAGTA | ACTGCTACTA | CTCTTCACAA | TGACGGATTC | ACAACAATAC | ATCCTGATGT | TGTTTGTAGT | TATTGGCAAC |
| 14910      | 14920      | 14930      | 14940      | 14950      | 14960      | 14970      | 14980      | 14990      | 15000      |
| ACCATCTTGA | GAATGTTGGG | AGAGTCGAAA | AAGTAATTGA | TGAGATACTT | GATGGTTTAG | CCACCAACTT | CTTCGCAGGA | GATAATGGGC | TTATTCTAAG |
| 15010      | 15020      | 15030      | 15040      | 15050      | 15060      | 15070      | 15080      | 15090      | 15100      |
| ATGTGGAGGA | ACTCCCAGCT | CTAGAAAATG | GTTAGAGATT | GATCAGTTAG | CATCATTTGA | TTCAGTTCAA | GATGCTCTAG | TGACACTTAT | CACCATACAC |
| 15110      | 15120      | 15130      | 15140      | 15150      | 15160      | 15170      | 15180      | 15190      | 15200      |
| CTAAAGGAAA | TTATAGAAGT | GCAGTCATCA | CATACAGAGG | ATTATACATC | TCTCCTTTTC | ACACCTTATA | ATATTGGTGC | AGCAGGGAAA | GTAAGAAGTA |
| 15210      | 15220      | 15230      | 15240      | 15250      | 15260      | 15270      | 15280      | 15290      | 15300      |
| TCATCAAATT | AATTCTAGAA | CGATCTTTAA | TGTATACAGT | CCGAAATTGG | TTAGTTTTC  | CCAGTTCCAT | CCGGGATTCC | GTACGACAAG | ATCTAGAGTT |
| 15310      | 15320      | 15330      | 15340      | 15350      | 15360      | 15370      | 15380      | 15390      | 15400      |
| AGGGTCATTT | AGATTAATGT | CTATTTTAAG | TGAACAGACA | TTTCTTAATA | AGACACCCAC | CAAAAAATAC | TTACTTGATC | AGCTTACAAG | GACATATATA |
| 15410      | 15420      | 15430      | 15440      | 15450      | 15460      | 15470      | 15480      | 15490      | 15500      |
| TCAACCTTCT | TTAATTCTCA | CTCAGTCCTC | CCCCTCCACC | GTCCATATCA | AAAACAAATA | TGGAAAGCCT | TAGGTAGTGT | AATATATTGT | TCGAGACGCG |
| 15510      | 15520      | 15530      | 15540      | 15550      | 15560      | 15570      | 15580      | 15590      | 15600      |
| TTGATATACC | TCTAATTAGA | GACATTCAGA | TAGAAGATAT | TAATGATTTT | GAAGATATCG | AGAGGGGTAT | CGATGGCGAA | GAATTATGAC | AACAGTGATT |
| 15610      | 15620      | 15630      | 15640      | 15650      |            |            |            |            |            |
| ATAAGAAGTC | ATGATAGTTT | TATTTAAGAA | AAACATATTG | ATTTTCCCCT | TGGT       |            |            |            |            |

Human Parainfluenza Virus Type 2 Strain V98 Antigenomic sense cDNA Sequence Range: 1 to 15654

|            |            |             |            |            |             |            |             |             |             |
|------------|------------|-------------|------------|------------|-------------|------------|-------------|-------------|-------------|
| 10         | 20         | 30          | 40         | 50         | 60          | 70         | 80          | 90          | 100         |
| ACCAAGGGGA | GAATTAGATG | GCATCGTTAT  | ATGACGAATT | GCAAAAAGAT | TACGTAGGTC  | CGGAACCACT | AGATTCCGGT  | GCCGGTAACG  | ATTCATTTTT  |
| 110        | 120        | 130         | 140        | 150        | 160         | 170        | 180         | 190         | 200         |
| TATACTATCT | GATCATTTCT | TATCTCTACT  | AAGGATATTT | CTAGTCTAAA | GTTCAAAATG  | TCAAGTGTCT | TAAAGACATT  | TGAAAGGTTT  | ACTATACAA   |
| 210        | 220        | 230         | 240        | 250        | 260         | 270        | 280         | 290         | 300         |
| AAGAGCTTCA | GGAGCAATCT | GATGACACTC  | CAGTACCTCT | TGAGACAATC | AAACCTACAA  | TAAGGGTATT | TGTCATCAAT  | AATAATGATC  | CTGCCATAAG  |
| 310        | 320        | 330         | 340        | 350        | 360         | 370        | 380         | 390         | 400         |
| GTCTAGACTT | TTATTCTTTA | ATCTACGAAT  | TATTATGAGT | AACACCCGAA | GAGAGGGACA  | TAGAGCTGGT | GCTCTCCTCA  | GTCTCTTATC  | ACTACCTTCT  |
| 410        | 420        | 430         | 440        | 450        | 460         | 470        | 480         | 490         | 500         |
| GCAGCTATGA | GTAATCACAT | CAAAC TAGCC | ATGCATTAC  | CAGAAGCCAG | CATAGATAGA  | GTAGAGATAA | CAGGGTTTGA  | GAATAATTCA  | TTCCGAGTTA  |
| 510        | 520        | 530         | 540        | 550        | 560         | 570        | 580         | 590         | 600         |
| TTCCAGATGC | TCGATCAACT | ATGTCCAGAG  | GAGAGGTGCT | GGCCTTTTGA | GCATTAGCTG  | AAGACATTCC | TGATACCCTT  | AATCACCAAA  | CTCCATTTGT  |
| 610        | 620        | 630         | 640        | 650        | 660         | 670        | 680         | 690         | 700         |
| AAATAATGAT | GTAAGAAGTG | ACATGTTTGA  | TGAAACAGAG | AAATCTCTAG | ATGTTTGCTA  | CAGTGTACTT | ATGCAGGCAT  | GGATAGTAAC  | ATGCAAGTGT  |
| 710        | 720        | 730         | 740        | 750        | 760         | 770        | 780         | 790         | 800         |
| ATGACTGTCT | CTGATCAGCC | GCCAGTATCA  | GAGCAAAAGC | GGATGGCTAA | ATATCAACAA  | CAAGGGAGAA | TCAATGCTAG  | GTATGTACTA  | CAGCCTGAAG  |
| 810        | 820        | 830         | 840        | 850        | 860         | 870        | 880         | 890         | 900         |
| CACAAAGACT | AATTCAGAAT | GCCATCCGCA  | AGTCAATGGT | AGTGAGGCAT | TTTCATGACTT | ATGAGCTTCA | ACTTTCACAA  | TCAAGATCTT  | TGCTAGCAAA  |
| 910        | 920        | 930         | 940        | 950        | 960         | 970        | 980         | 990         | 1000        |
| CCGCTACTAT | GCTATGGTGG | GAGACATTGG  | CAAGTACATT | GAACACAGCG | GAATGGGAGG  | TTTTTTCTTA | ACACTTAAAT  | ATGGACTTGG  | AACAAGATGG  |
| 1010       | 1020       | 1030        | 1040       | 1050       | 1060        | 1070       | 1080        | 1090        | 1100        |
| CCTACATTGG | CTCTTGACG  | ATTCTCTGGG  | GAATCCAGCA | AATTAAGAAC | TCTCATGCTA  | CATTATCAGA | GCCTAGGACC  | CATGGCCAA   | TACATGGCTC  |
| 1110       | 1120       | 1130        | 1140       | 1150       | 1160        | 1170       | 1180        | 1190        | 1200        |
| TATTAGAATC | ACCAAAGCTG | ATGGATTGTT  | TCCCATCTGA | ATATCCATTA | GTTTATAGTT  | ATGCAATGGG | TATTGGAACT  | GTCTTGATA   | CAAATATGAG  |
| 1210       | 1220       | 1230        | 1240       | 1250       | 1260        | 1270       | 1280        | 1290        | 1300        |
| AAACTATGCA | TATGGTAGAT | CATATTTAAA  | TCCGCAATAT | TTTCAGCTAG | GAGTAGAAAC  | AGCAAGGAAA | CAGCAGGGAG  | CTGTTGACAA  | CAGGACAGCA  |
| 1310       | 1320       | 1330        | 1340       | 1350       | 1360        | 1370       | 1380        | 1390        | 1400        |
| GAGGACCTCG | GCATGACTGC | TGCAGACAAA  | GCAGACCTCA | CTGCAACCAT | ATCAAAGCTA  | TCTTTGTCCC | AATTACCTAG  | GGGTAGACAA  | CCAATATCTG  |
| 1410       | 1420       | 1430        | 1440       | 1450       | 1460        | 1470       | 1480        | 1490        | 1500        |
| ACCCATTTCG | TGGAGCAAAT | GACAGAGAAA  | TAGGAGGCCA | AGCAAATGAT | ACACCTGTAT  | ACAACCTCAA | TCCAATCAAT  | ACTCGGAGGT  | ATGACAACATA |
| 1510       | 1520       | 1530        | 1540       | 1550       | 1560        | 1570       | 1580        | 1590        | 1600        |
| TGACAGTGAT | GGTGAGGACA | GAATTGACAA  | CGATCAAGAT | CAAGCTATCA | GAGAGAACAG  | AGGAGAGCCT | GGACAACATA  | ACAACCAGAC  | AAGTGACAAC  |
| 1610       | 1620       | 1630        | 1640       | 1650       | 1660        | 1670       | 1680        | 1690        | 1700        |
| CAGCAGAGAC | TCAATCTCTC | CATACCAGCA  | AGAACATCAG | GTATGAGCAG | TGAAGAGTTC  | CAACATTCAA | TGAATCAGTA  | CATCCGTGCC  | ATGCATGAGC  |
| 1710       | 1720       | 1730        | 1740       | 1750       | 1760        | 1770       | 1780        | 1790        | 1800        |
| AATACAGAGG | ACCCAGGAT  | GATGATACCA  | ATGATGCCGC | AGATGGGAAT | GACATTTCCT  | TTGAGCTAGT | TGGGGATTTT  | GATTCCCTAAT | TCTCAATGTC  |
| 1810       | 1820       | 1830        | 1840       | 1850       | 1860        | 1870       | 1880        | 1890        | 1900        |
| ATACAACAGG | ATATACACAT | CCACATCACT  | TAAAGATACA | GCTGCCACCC | ACACACTCAT  | CCAGACAAAT | CAAACAGAC   | TCACATCATT  | CAGAAACAAAT |
| 1910       | 1920       | 1930        | 1940       | 1950       | 1960        | 1970       | 1980        | 1990        | 2000        |
| TCTCTCATAA | TTTAAGAAAA | AAACATAGGC  | CCGACGCGGT | TTAAAATCTG | GTGCTCGTTC  | GTGGTCTGAC | AACCTCCAAA  | CCAGAAATCAC | ACAATTATGG  |
| 2010       | 2020       | 2030        | 2040       | 2050       | 2060        | 2070       | 2080        | 2090        | 2100        |
| CCGAGGAACC | AACATACACC | ACTGAGCAAG  | TTGATGAAC  | AATCCATGCT | GGACTGGGAA  | CAGTAGATTT | CTTCCTATCT  | AGACCCATAG  | ATGCTCAATC  |
| 2110       | 2120       | 2130        | 2140       | 2150       | 2160        | 2170       | 2180        | 2190        | 2200        |
| TTCCCTAGGC | AAGGGCAGCA | TCCCACAGG   | TGTCACAGCT | GTTCTAATA  | GTGCAGCAGA  | GGCAAAATCC | AAACCAAGTTG | CCGCTGGTCC  | AGTGAAACCC  |
| 2210       | 2220       | 2230        | 2240       | 2250       | 2260        | 2270       | 2280        | 2290        | 2300        |
| AGGCGGAAGA | AAGTGATCAG | CAATGCTACC  | CCATACACTG | TTGCAGACAA | TACTCCACCT  | GAGAAGCTAC | CAATCAACAC  | CCCAATACCC  | AATCCATTAC  |
| 2310       | 2320       | 2330        | 2340       | 2350       | 2360        | 2370       | 2380        | 2390        | 2400        |
| TTCCACTGGC | ACGCCCCCAA | GGAAAGATGA  | CAGACATTGA | CATTGTCACT | GGGACCATT   | CAGAGGATC  | GTACAAAGGT  | GTGGAGCTTG  | CTAAATTAGG  |
| 2410       | 2420       | 2430        | 2440       | 2450       | 2460        | 2470       | 2480        | 2490        | 2500        |
| GAAGCAAACA | CTACTCACAA | GGTTCACCTC  | GAACGAGCCA | GTCTCCTCAG | CTGGATCCGC  | CCAAGACCCC | AACCTTAAAG  | GGGGGGGAGC  | TAATAGAGAA  |
| 2510       | 2520       | 2530        | 2540       | 2550       | 2560        | 2570       | 2580        | 2590        | 2600        |
| AGAGCAAGAG | GCAACCATAG | GAGAGAATGG  | AGTATTGCAT | GGGTCCGAGA | TCAGGTCAAA  | GTCTTCGAGT | GGTGAATCC   | CAGGTGTGCC  | CCAGTCACGG  |
| 2610       | 2620       | 2630        | 2640       | 2650       | 2660        | 2670       | 2680        | 2690        | 2700        |
| CCTCAGCTCG | CAAGTTCAAC | TGCATATGCG  | GATCCTGCCC | CAGCATCTGC | GGAGAATGTG  | AAGGAGATCA | TTGAGCTCTT  | AAAGGGGCTT  | GATCTTCGCC  |
| 2710       | 2720       | 2730        | 2740       | 2750       | 2760        | 2770       | 2780        | 2790        | 2800        |
| TTCAGACTGT | AGAAGGGAAG | GTAGATAAAA  | TTCTTGCAAC | TTCCGCAACT | ATAATCAATC  | TTAAAAATGA | AATGACTAGT  | CTCAAGGCGA  | GCGTTGCAAC  |
| 2810       | 2820       | 2830        | 2840       | 2850       | 2860        | 2870       | 2880        | 2890        | 2900        |
| TGTGGAAGGT | ATGATAACAA | CAATTAAAAAT | CATGGATCCC | AGCACACCAA | CCAATGTCCC  | TGTAGAGGAG | ATCAGAAAGA  | GCTTACACAA  | TGCTCCAGTA  |

FIGURE 10A

```

2910      2920      2930      2940      2950      2960      2970      2980      2990      3000
GTAATTGCCG GTCCAACACTG TGGAGGCTTC ACAGCCGAAG GCAGTGATAT GATTTC AATG GATGAAGTAT CTAGACCTAC ACTCTCATCA AAAAAAAGA

3010      3020      3030      3040      3050      3060      3070      3080      3090      3100
TCACACGAAA GCCTGAATCC AAGAAAGACT TAACAGGCAC AAAACTAACC TTGATGCAGC TTGCAATGA CTGCATCTCG CGTCCAGATA CCAAGACTGA

3110      3120      3130      3140      3150      3160      3170      3180      3190      3200
GTTCTGTGACT AAGATTCAAG CAGCAACCAC AGAATCACAG CTTAATGAAA TCAAGCGGTC AATAATACGC TCTGCAATAT AAAATGAGGT GCAATCACAC

3210      3220      3230      3240      3250      3260      3270      3280      3290      3300
AAGAGACACT CAACATGCAT CCAATCAAGA TCCAAATTCT GTCCATCCGA AAACACACCC ACAATTGTGA ACACCAAGAA ACAACCACAG CCGAACCATTG

3310      3320      3330      3340      3350      3360      3370      3380      3390      3400
CTTAATCAAA AGATCCAAAC AACATCTCAC ATCGACAGAA GGCTGGACAT GATAAATTTA ATAAAAAGA AAAAAAAGTC AAGTAAATTT TAAAGGACAC

3410      3420      3430      3440      3450      3460      3470      3480      3490      3500
AATAGAGAAA ATCTAGGTCC GAAAGCTTGC TTCCCGGACA GATCTCAAAA TCATAGTCTA AACCTCAAAC ACAGCAGCAG ACATGCCCAT AATATCATT

3510      3520      3530      3540      3550      3560      3570      3580      3590      3600
CCAGCAGATC CAACTTCACC CAGTCAATCC CTTACTCCGT TTCCAATACA ACTTGACACC AAAGATGGCA AGGCAGGGAA ACTCCTTAAA CAGATTTCGAA

3610      3620      3630      3640      3650      3660      3670      3680      3690      3700
TTAGGTATCT AAATGAGCCT AATTCTCGCC ATACACCAAT AACTTTCATC AATACGTATG GATTGTGTTA TGCTCGAGAC ACTTCAGGGG GCATTTCACAG

3710      3720      3730      3740      3750      3760      3770      3780      3790      3800
TGAGCTTAGT AGTGACCTAG CTGCAGGGTC TATAACAGCA TGCGATGATG CGCTAGGCCC TGGTCCAAAT ATTCAAGATG CAAATCTAGT GCTAAGATCT

3810      3820      3830      3840      3850      3860      3870      3880      3890      3900
CTGAATGAAT TCTACGTGAA AGTCAAGAAG ACATCAAGCC AGAGAGAGGA AGCAGTGTTC GAATTAGTTA ACATTCCAAC TTTATTGAGA GAACATGCTC

3910      3920      3930      3940      3950      3960      3970      3980      3990      4000
TTTGCAACCG CAAAATGTTA GTTTGCTCTG CAGAAAAGTT CCTCAAGAAC CCGTCAAAGC TACAAGCTGG ATTTGAGTAT GTATACATAC CAACTTTTGT

4010      4020      4030      4040      4050      4060      4070      4080      4090      4100
CTCCATTACA TACTACCCAC GAAATCTGAA TTACCAAGTT GCCAGACCTA TCCTTAAGTT CAGATCAGCT TTTGTGTATA GCATTCATTT GGAATTAATT

4110      4120      4130      4140      4150      4160      4170      4180      4190      4200
CTGAGATTGC TATGCAAATC TGAATCCCCC TTAATGAAAT CCTACAATGC AGACAAACA GGTCTGGGAT GCCTTGCATC AGTCTGGATC CATGTATGTA

4210      4220      4230      4240      4250      4260      4270      4280      4290      4300
ACATTCTGAA AAACAAAAGC ATCAAGCAAC AAGGCAGAGA ATCATATTTT ATAGCCAAGT GCATGAGCAT GCAGCTGCAG GTGTCCATTG CAGATCTTTG

4310      4320      4330      4340      4350      4360      4370      4380      4390      4400
GGGACCAACA ATCATAATCA AATCATTGGG TCACATCCCC AAGACTGCAC TTCCTTTTTT CAGCAAAGAT GGGATTGCCT GTCATCCATT ACAAGATGTT

4410      4420      4430      4440      4450      4460      4470      4480      4490      4500
TCCCCCACTC TGACAAAATC ACTGTGGTCA GTTGATGTGT AGATAGAATC TGCCAAGTTG ATACTTCAAG AATCTGATCT TAATGAGCTA ATGGGCCACC

4510      4520      4530      4540      4550      4560      4570      4580      4590      4600
AGGACCTTAT CACTGATAAG ATTGCCATCA GATCAGGTCA ACGGACATTT GAGAGGTCCA AATTCAGCCC ATTTAAAAA TATGCATCAA TTCCAACCTT

4610      4620      4630      4640      4650      4660      4670      4680      4690      4700
GGAAGCCATC AACTGAATGC TCCAGCATCT GAGAATAGAA CCACAATTAA ATCATACTAT TAGTAATAT ACAATAATAA ACAATTTTGA TCAACAGATT

4710      4720      4730      4740      4750      4760      4770      4780      4790      4800
ACCAAGATGT TATCATAGGT CCGAACTGAT CAATCTAACA AAAAACTAA ACGTTCCATA ATAAATCAAC GTTCAGGTCA AAATACTCAA CCATGCATCA

4810      4820      4830      4840      4850      4860      4870      4880      4890      4900
CCTACATCCA ATGATAGTAT GCATCTTTGT TATGTACACT GGAATTGTAG GTTCAGGTGC CATGTCCGGA GACCAACTAC TTAATATAGG GGTCATTCAA

4910      4920      4930      4940      4950      4960      4970      4980      4990      5000
TCAAAGATAA GATCACTCAT GTACTATACT GATGGTGGTG CTAGCTTTAT TGTGTGTTAA TTGCTACCTA ATCTTCCCCC AAGCAATGGA ACATGCAACA

5010      5020      5030      5040      5050      5060      5070      5080      5090      5100
TTACCAGTCT AGATGCATAC AATGTTACCC TATTTAAATT ACTGACACCC CTGATTGAGA ACCTGAGCAA AATCTCCGCT GTTACAGATA CCAAAACCCG

5110      5120      5130      5140      5150      5160      5170      5180      5190      5200
CCAAGAACGA TTTGCAGGAG TCGTTGTTGG ACTTGCTGCA TTAGGAGTAG CCACAGCTGC ACAAATAACC GCAGCTGTAG CAATAGTTAA AGCTAATGCA

5210      5220      5230      5240      5250      5260      5270      5280      5290      5300
AATGTGCGCG CGATTAATAA TCTTGCATCT TCAATTCAAT CAACAACAA GGCAGTATCC GATGTGATAG ATGCATCAAA AACAATTGCA ACTGCAGTTC

5310      5320      5330      5340      5350      5360      5370      5380      5390      5400
AAGCAATCCA GGATCATATC AATGGAGCTA TTGTTAATGG GATAACATCT GCATCATGCC GTGCCCATGA TGCACTCATT GGGTCAATAT TAAATCTTTA

5410      5420      5430      5440      5450      5460      5470      5480      5490      5500
TCTCACTGAG CTTACCACAA TATTTACAAA TCAAATAACA AACCCTGCGC TGACACCGCT CTCCATCCAA GCTTTAAGAA TTCTCCTCGG TAGCACCTTG

5510      5520      5530      5540      5550      5560      5570      5580      5590      5600
CCAATTGTCA TTGAGTCCAA ACTCAACACA AACCTCAACA CAGCAGAGCT GCTCAGCTCC GGACTGTGTA CTGGTCAAAAT AATTCAATT TCCCAATGT

5610      5620      5630      5640      5650      5660      5670      5680      5690      5700
ACATGCAAAAT GCTAATTCAA ATCAATGTTC CGACATTAT AATGCAACCC GGTCCGAAGG TAATTGATCT AATTGCTATC TCTGCAAAACC ATAAATTGCA

5710      5720      5730      5740      5750      5760      5770      5780      5790      5800
AGAAGTAGTT GTACAAGTTC CGAATAGGAT TCTAGAGTAT GCAATGAAC TACAAAATTA TCCAGCCAAT GACTGTGTTG TGACATCCGA CTCTGTATTCT

```

FIGURE 10B

5810 5820 5830 5840 5850 5860 5870 5880 5890 5900  
TG TAGATACA ATGAGGGTTC CCTATCCCT GAATCACAAT ACCAATGCTT GAGGGGGAAT CTTAATTCTT GCACCTTTTAC CCCTATTATC GGGAACTTTT  
5910 5920 5930 5940 5950 5960 5970 5980 5990 6000  
TTAAGCGATT TGCATTGGCC AATGGTGTGC TCTATGCCAA CTGCAAATCT TTGTGTATGTA AGTGTGCCGA CCCTCCCAT GTGGTGTCCC AAGATGATAC  
6010 6020 6030 6040 6050 6060 6070 6080 6090 6100  
CCAAGGCATC AGCATAATTG ATATTAAGAG ATGCTCTGAG ATGATGCTTG ACACCTTCTC ATTTAGGATC ACATCTACGT TCAATGCTAC ATACGTGACA  
6110 6120 6130 6140 6150 6160 6170 6180 6190 6200  
GACTTCTCAA TGATTAATGC AAATATTGTA CATCTAAGTC CTCTAGATT TTGCAAACCAA ATCAATTCAA TAAACAAATC TCTTAAAGT GCTGAGGATT  
6210 6220 6230 6240 6250 6260 6270 6280 6290 6300  
GGATTGCAGA TAGCAACTTC TTTGCTAATC AAGCCAGGAC AGCCAAGACA CTTTATTTCAT TAAGTGCAAT AGCATTAAATA CTATCAGTGA TTACCTTGGT  
6310 6320 6330 6340 6350 6360 6370 6380 6390 6400  
TGTTGTGGGA TTGCTGATTG CCTACATCAT CAAACTAGTT TCCCAATCC ATCAATTTCAG AGCGCTAGCT GCTACAACAA TGTTCACAG GGAATCCCT  
6410 6420 6430 6440 6450 6460 6470 6480 6490 6500  
GCCTCTTTT CCAAGAACAA TCATGGAAAC ATATATGGGA TATCTTAAGA AATCTATCAC AAGTCCATAT ATGTCCACAA TTGATTCTTA AGAACCAACT  
6510 6520 6530 6540 6550 6560 6570 6580 6590 6600  
TCCAATGATT ATCCCTTTAA CTTAAGTATA ATAGTTTAAA AATTAACATT AAGCCTCCAG ATACCAATGA ATATGAATAT ATCTCTAAGA AAACCTGATT  
6610 6620 6630 6640 6650 6660 6670 6680 6690 6700  
ATTATGTGAT AGTGTAGTAC AATTTAAGAA AAAACCTAAA ATAAGCAGCA ACCCTTAAGG TGTCGTAACG TCTCGTGACA CTGGTTCAG TTCAAAAATC  
6710 6720 6730 6740 6750 6760 6770 6780 6790 6800  
GACTTCTAAT CTAATTTAAC ACCCATCTCT ATATAAGAAC ACAGTATAAC TTAATTAGAA AAGACCTCAA AAACCTGACAC AGCTTAATCC ACTCAACATA  
6810 6820 6830 6840 6850 6860 6870 6880 6890 6900  
TAATTGTAGG ATTAATAATA ATGGAAGATT ACAGCAATCT ATCTCTTAAA TCAATTCCCTA AAAGGACATG TAGAATCATT TTCCGAAGTG CCACAATTCT  
6910 6920 6930 6940 6950 6960 6970 6980 6990 7000  
TGGAATATGC ACATTGATTG TTCTATGTTC AAGTATTCTT CATGAAATAA TTCATCTTGA TGCTTCCTCT GGTCTCATGA ATTCTGATGA TTCACAGCAA  
7010 7020 7030 7040 7050 7060 7070 7080 7090 7100  
GGCATTATTC AGCCTATTGT AGAATCATT AAATCATTTGA TTGCTTTGGC TAACCAGATT CTGTACAATG TTGCAATAAT AATTCCTCTT AAAATTGACA  
7110 7120 7130 7140 7150 7160 7170 7180 7190 7200  
GTATTGAGAC CGTAATACTC TCTGCTTYAA AGGAYATGCA TACTGGGAGC ATGTCCAACA CCAACTGTAC ACCCGGAAAT CTGCTTCTGC ATGATGCAGC  
7210 7220 7230 7240 7250 7260 7270 7280 7290 7300  
ATACATCAAT GGAATAAACA AATTCCTTGT ACTTAATCA TACAATGGTA CGCCTAAATA TGGACCTCTC CTAAATATTC CTAGCTTTAT CCCCTCAGCA  
7310 7320 7330 7340 7350 7360 7370 7380 7390 7400  
ACATCTCCCC ACGGGTGCAC TAGAATACCA TCATTTTCAC TCAGTAAGAC TCATTGGTGT TACACTCACA ATGTAATACT TGGAGATTGC CTCGATTCTA  
7410 7420 7430 7440 7450 7460 7470 7480 7490 7500  
CGACATCTAA TCAGTATTTA GCAATGGGGA TAATACAACA ATCTGCTGCA GCATTTCCAA TCTTCAGGAC TATGAAAACC ATTTACCTAA GTGATGGAAT  
7510 7520 7530 7540 7550 7560 7570 7580 7590 7600  
CAATCGCAAA AGCTGTTCAG TCACTGCCAT ACCAGGAGGT TGTGTCTTGT ACTGCTATGT AGCTACAAGA TCTGAGAAAG AAGATTATGC CACAAGTAT  
7610 7620 7630 7640 7650 7660 7670 7680 7690 7700  
CTAGCTGAAC TGAGACTTGC TTTCTATTAT TATAATGATA CCTTTGTTGA AAGAGTCATA TCTCTTCCAA ATACAACAGG GCAATGGGCC ACAATCAATC  
7710 7720 7730 7740 7750 7760 7770 7780 7790 7800  
CTGCAGTTGG AAGCGGGATC TATCATCTAG GCTTTATTTT ATTTCCCTGTA TATGGTGGTC TCATAAATGG GACTCCTTCC TACAACGAGC AGTCTCTCAG  
7810 7820 7830 7840 7850 7860 7870 7880 7890 7900  
CTATTTTATC CCAACACATC CCAACATAAC CTGTGCCGGA AACTCCAGTG AACGGGCTGC AGCAGCACGG GGTTCCTATG TCATCCGTTA TCATTCAAAAC  
7910 7920 7930 7940 7950 7960 7970 7980 7990 8000  
AGGTTGATTG AGAGTGCTAT TCTTATTGTC CCATTATCTG ACATGCAAAC AGCAAGGTGT GATCTAGTTA TGTTTAACAA TTCTCAAGTC ATGATGGGTG  
8010 8020 8030 8040 8050 8060 8070 8080 8090 8100  
CAGAAGGTAG GCTCTATGTT ATTGACAACA ATTTGTATTA TTATCAACGT AGTTCCCTCTT GGTGGTCTGC ATCGCTTTTC TACAGGATCA ATACAGATTT  
8110 8120 8130 8140 8150 8160 8170 8180 8190 8200  
CTCTAAAGGA ATTCCTCTTA TCATTGAGGC TCAATGGGTA CCGTCTCTATC AAGTTCCCTG CCCTGGAGTC ATGCCATGTA ATGCAACAAG TTTTGGCCCT  
8210 8220 8230 8240 8250 8260 8270 8280 8290 8300  
GCTAATTGCA TCACAGGAGT GTATGCAGAT GTGTGCCGCG TTAACGATCC AGAAGTCACA TCACAAAATG CTCTGAATCC CAACTATCGA TTTGCTGGAG  
8310 8320 8330 8340 8350 8360 8370 8380 8390 8400  
CCTTTCTAAA AAATGAGTCC AACCGAACCA ATCCCACATT TTACTCTGCA TCAGCCCACT CCCTACTAAA TACTACCGGA TTCAACAACA CCAATCACAA  
8410 8420 8430 8440 8450 8460 8470 8480 8490 8500  
AGCAGCATAT ACGTCTTCAA CCTGCTTTAA GAATACTGGA ACTCAGAAGA TTTATTGTTT GATAATAATC GAAATGGGCT CATCTCTTTT AGGGGAGTTC  
8510 8520 8530 8540 8550 8560 8570 8580 8590 8600  
CAAATAATAC CATTTCTAAG GGAAGTAATA CCTTAATACT ATTGAATGAA AACTTAAGAT TCAATAATAA TTGAAAGGCT CTCTATCTTA TGTAATAGTT  
8610 8620 8630 8640 8650 8660 8670 8680 8690 8700  
ATACGTTTTG GCTGTATTAG AATGTTATAG CATTTCTGCTG TGTTCCTCAT ATGAAGCAAG CCTCAACAC CGACTTAGGT TCAATTTTCT CATCATTTAC

FIGURE 10C

|             |             |            |            |             |            |            |            |             |            |
|-------------|-------------|------------|------------|-------------|------------|------------|------------|-------------|------------|
| 8710        | 8720        | 8730       | 8740       | 8750        | 8760       | 8770       | 8780       | 8790        | 8800       |
| TGTTGTAAATC | CAATCTTACT  | AAAGTTATTC | TGATATTTAA | GAATAAATAA  | CCTTTATATA | ATATAACAAT | ACTATTAAGA | TTATGATATA  | GGCCAGAATG |
| 8810        | 8820        | 8830       | 8840       | 8850        | 8860       | 8870       | 8880       | 8890        | 8900       |
| GCGGCCTCTT  | CTGAGATACT  | CCTTCTGAA  | GTCCACTTGA | ACTCACCAT   | AGTCAACAC  | AAACTCATAT | ACTACTTATT | ACTAGGGCAC  | TTCCCGCATG |
| 8910        | 8920        | 8930       | 8940       | 8950        | 8960       | 8970       | 8980       | 8990        | 9000       |
| ATCTTGACAT  | TTCTGAAATA  | AGCCCTCTTC | ACAATAATGA | TTGGGATCAA  | ATTGCCAGAG | AAGAATCCAA | TCTTGCTGAA | CGACTTGGAG  | TAGCTAAATC |
| 9010        | 9020        | 9030       | 9040       | 9050        | 9060       | 9070       | 9080       | 9090        | 9100       |
| TGAATTAAT   | AAACGTGTGC  | CCGCATTAG  | AGCAACTAGA | TGGCGTAGTC  | ATGCAGCTGT | CCTTATATGG | CCTTCTTGTA | TACCATTCTT  | TGTTAAATTC |
| 9110        | 9120        | 9130       | 9140       | 9150        | 9160       | 9170       | 9180       | 9190        | 9200       |
| CTACCTCATT  | CTAAGCTTCA  | ACCAATAGAA | CAATGGTACA | AGTTGATCAA  | TGCTTCATGT | AATACTATAT | CTGACTCAAT | TGATAGATGT  | ATGGAGAATA |
| 9210        | 9220        | 9230       | 9240       | 9250        | 9260       | 9270       | 9280       | 9290        | 9300       |
| TTTCTATTAA  | GCTTACTGGG  | AAAAACAATC | TATTCCTCTG | ATCCAGAGGA  | ACTGCAGGTG | CAGGTAAAAA | CAGTAAATAT | ACCCCTCAATG | ATATCCAATC |
| 9310        | 9320        | 9330       | 9340       | 9350        | 9360       | 9370       | 9380       | 9390        | 9400       |
| TATTTGGGAA  | TCAACAAGT   | GGCAGCTAA  | TGTATCTTTA | TGGCTTACAA  | TTAAATATCA | AATGCGACAA | CTTATAATGC | ATCAAAGTTC  | TCGTAGCCG  |
| 9410        | 9420        | 9430       | 9440       | 9450        | 9460       | 9470       | 9480       | 9490        | 9500       |
| ACTGATTTAG  | TTCACATTGT  | TGACACACGA | TCTGGTCTAA | TAGTTATCAC  | CCCTGAACCT | GTTATTTGTT | TTGATCGGTT | GAATAGTGTT  | TTAATGTATT |
| 9510        | 9520        | 9530       | 9540       | 9550        | 9560       | 9570       | 9580       | 9590        | 9600       |
| TTACATTGGA  | GATGACTTTA  | ATGTAAGCG  | ACATGTTCGA | GGGGAGGATG  | AATGTCACTG | CTCTCTGCAC | TATTAGTCAT | TACTTATCTC  | CACTAGGGCC |
| 9610        | 9620        | 9630       | 9640       | 9650        | 9660       | 9670       | 9680       | 9690        | 9700       |
| AAGGATCGAT  | AGATTGTTTT  | CCATTGTAGA | TGAATTAGCA | CAACTATTAG  | GTGACACTGT | ATATAAAGTT | ATTGCATCTC | TTGAATCTTT  | AGTATATGGG |
| 9710        | 9720        | 9730       | 9740       | 9750        | 9760       | 9770       | 9780       | 9790        | 9800       |
| TGCTTACAAC  | TTAAGATCC   | AGTAGTGGAA | TTAGCAGGGT | CATTTTCATT  | CTTTATTACA | CAAGAGATTA | TAGATATCCT | AATTGGTTCA  | AAAGCCCTTG |
| 9810        | 9820        | 9830       | 9840       | 9850        | 9860       | 9870       | 9880       | 9890        | 9900       |
| ATAAGGATGA  | ATCAATAACT  | GTTACTACAC | AATTGTTAGA | TATATTTTCC  | AACCTTCTC  | CAGATTAAAT | TGCTGAGATG | TTGTGTCTCA  | TGAGACTTTG |
| 9910        | 9920        | 9930       | 9940       | 9950        | 9960       | 9970       | 9980       | 9990        | 10000      |
| GGGTATCCT   | ACTCTTACTG  | CTGCGCAAGC | TGCAGGTAAA | GTGAGAGAAT  | CTATGTGTGC | AGGTAAGTTG | CTTGATTTC  | CTACAATAAT  | GAAACTCTT  |
| 10010       | 10020       | 10030      | 10040      | 10050       | 10060      | 10070      | 10080      | 10090       | 10100      |
| GCTTTTCTCC  | ACACAATTTT  | AATTAATGGT | TACCGTAGAA | AGAAAATGG   | AATGTGGCCT | CCACTTATAC | TTCTTAAAA  | TGCATCAAAA  | AGCTTAATAG |
| 10110       | 10120       | 10130      | 10140      | 10150       | 10160      | 10170      | 10180      | 10190       | 10200      |
| AATTTCAACA  | TGATAATGCT  | GAAATATCTT | ACGAATATAC | ACTCAAGCAT  | TGGAAGAGAA | TCTCTCTCAT | AGAATTGAGA | AAGTGCTTTG  | ACTTTGATCC |
| 10210       | 10220       | 10230      | 10240      | 10250       | 10260      | 10270      | 10280      | 10290       | 10300      |
| TGGTGAGGAG  | CTAAGCATTT  | TTATGAAGGA | CAAGGCAATA | AGTGCTCCAA  | AAAGTGATTG | GATGAGTGTA | TTTCGTAGAA | GTCTAATAAA  | ACAACGACAT |
| 10310       | 10320       | 10330      | 10340      | 10350       | 10360      | 10370      | 10380      | 10390       | 10400      |
| CAGAGACATC  | ATATTCCTAT  | GCCCAATCCA | TTTAATAGAC | GTCTATTACT  | CAATTTCTTA | GAAGATGACA | GTTTGGACCC | AGTTGCTGAG  | CTCCAATATG |
| 10410       | 10420       | 10430      | 10440      | 10450       | 10460      | 10470      | 10480      | 10490       | 10500      |
| TTACCACTGG  | TGAATACCTC  | CAAGATGACA | CATTTTGTGC | ATCTTACTCA  | TTAAAAGAGA | AAGAAATAAA | ACCAGATGGA | AGGATATTGC  | CTAAGCTTAC |
| 10510       | 10520       | 10530      | 10540      | 10550       | 10560      | 10570      | 10580      | 10590       | 10600      |
| TAATAGAAATG | CGGTCTGTGC  | AAGTAATTGC | GGAAGCAATT | CTTGCAAAATC | ATGCAGGTAC | TCTAATGAAG | GAAAACGGAG | TTGTCTTGAA  | TCAATTATCA |
| 10610       | 10620       | 10630      | 10640      | 10650       | 10660      | 10670      | 10680      | 10690       | 10700      |
| CTGACCAAGT  | CATTGCTTAC  | TATGAGTCAA | ATTGGCATAA | TATCAGAAAA  | GGCAAGAGAA | TATACGCGAG | ATAACATCTC | ATCTCAAGGT  | TTCCATACAA |
| 10710       | 10720       | 10730      | 10740      | 10750       | 10760      | 10770      | 10780      | 10790       | 10800      |
| TCAAGACTGA  | CTCTAAAAAT  | AAGAGGAAAA | GCAAACTGTC | ATCATCATAC  | CTCACAGATC | CTGATGATAC | ATTTGAACTT | AGTGCATGTT  | TTATAACTAC |
| 10810       | 10820       | 10830      | 10840      | 10850       | 10860      | 10870      | 10880      | 10890       | 10900      |
| TGATCTTGCT  | AAATACTGTC  | TTCAATGGAG | ATATCAGACC | ATAATCCATT  | TTGCTCGAAC | ATTAAACAGA | ATGTATGGAG | TTCCACATTT  | ATTGAATGG  |
| 10910       | 10920       | 10930      | 10940      | 10950       | 10960      | 10970      | 10980      | 10990       | 11000      |
| ATTCATCTTC  | GTTTAATTAG  | GTCTACATTA | TATGTTGGTG | ATCCATTCAA  | TCCCCTGCT  | GCGACTGATG | CTTTCGATCT | AGATAAAGTA  | TTAAATGGTG |
| 11010       | 11020       | 11030      | 11040      | 11050       | 11060      | 11070      | 11080      | 11090       | 11100      |
| ATATCTTTAT  | AGTCTCTCCC  | AAAGGAGGTA | TTGAAGGCCT | ATGTGAGAAA  | ATGTGGACAA | TGATCTCTAT | TTCTGTGATC | ATCCTCTCCT  | CAGCCGAATC |
| 11110       | 11120       | 11130      | 11140      | 11150       | 11160      | 11170      | 11180      | 11190       | 11200      |
| CAAAACAAGA  | GTAATGAGCA  | TGGTTCAAGG | AGATAATCAG | GCAATTGCAG  | TTACAACAAG | AGTTCCTAGA | TCATTACCTA | GTATTAGAAA  | AAAGGAGTTA |
| 11210       | 11220       | 11230      | 11240      | 11250       | 11260      | 11270      | 11280      | 11290       | 11300      |
| GCCTATGCGAG | CAAGCAAGTT  | ATTTTGTGAA | AGACTTAGGG | CAATAATTA   | TGGGTGGGT  | CATCAGCTAA | AGGCTCAAGA | AACTATAATA  | AGTTCCACAT |
| 11310       | 11320       | 11330      | 11340      | 11350       | 11360      | 11370      | 11380      | 11390       | 11400      |
| TCTTCATATA  | TAGTAAACGG  | GATTTTATAT | AAGGACGTAT | ACTAACACAG  | GCACTCAAAA | ACGCTAGCAA | GCTATGTCTT | ACTGCGGATG  | TATTAGGTGA |
| 11410       | 11420       | 11430      | 11440      | 11450       | 11460      | 11470      | 11480      | 11490       | 11500      |
| ATGTACTCAA  | GCTTCTGTGT  | CAAAATCTGC | TACTACCATC | ATGAGATTAA  | CAGAAAATGG | GGTTGAGAAA | GATACATGTT | ATAAGCTTAA  | TATTATCAG  |
| 11510       | 11520       | 11530      | 11540      | 11550       | 11560      | 11570      | 11580      | 11590       | 11600      |
| TCCATTCTGTC | AACCTCACATA | TGATCTAATA | TTTCCCAAT  | ATTCATACAC  | AGGTGAAACG | ATAAGTGGGA | TTTCTCTGCA | GCATCCAAGA  | CTAATCTCAC |

FIGURE 10D

11610 11620 11630 11640 11650 11660 11670 11680 11690 11700  
GTATTGTTCT GCTCCCTTCA CAGCTAGGTG GTCTTAATTA CCTCGCATGC AGCAGATTAT TTAACCGCAA TATCGGAGAT CCTCTTGGTA CAGCTGTGGC  
11710 11720 11730 11740 11750 11760 11770 11780 11790 11800  
GGACCTCAAG AGGTTAATTA AATGTGGTGC TCTTGAATCA TGGATACTGT ACAATTACT AGCAAGAAAA CCAGGGAAG GTTCATGGGC AACTTTAGCA  
11810 11820 11830 11840 11850 11860 11870 11880 11890 11900  
GCCGATCCGT ACTCATTGAA TCAAGAATAT CTTTATCCTC CTACTACTAT ACTTAAAGA CATACTCAAC ATACTTTAAT GGAGATATGT AGGAATCCCTA  
11910 11920 11930 11940 11950 11960 11970 11980 11990 12000  
TGTTAAAGGG AGTTTTCACA GATAATGCAA AAGAGGAGGA AAATCTCCTT GCAAAATTC TTCTTGATCG TGATATAGTA TTGCCAAGAG TTGCGCACAT  
12010 12020 12030 12040 12050 12060 12070 12080 12090 12100  
TATAATAGAT CAATCTAGCA TCAGGAAGAA GAAACAGATA CAAGGATTTT TTGACACCAC AAGGACCATT ATGAGACGAT CATTGGAAT CAAACCACTC  
12110 12120 12130 12140 12150 12160 12170 12180 12190 12200  
TCAACTAAGA AGACTCTTTC AGTTATAGAA TATAATACAA ATTACTTATC TTATAACTAC CCTGTACATC TTAATCCTTT ACCTATTCCC GGATATTAA  
12210 12220 12230 12240 12250 12260 12270 12280 12290 12300  
ATTATATTAC TGACCAAACT TGCAGTATTG ATATATCTAG AAGTTTAAAG AAATTATCAT GGTCTTCTTT ATTGAATGGA AGAAGTTAG AAGGATTAGA  
12310 12320 12330 12340 12350 12360 12370 12380 12390 12400  
AATCCAGAT CCAATTGAGG TTGTCAATGG TTCCTTGATT GTAGGTACAG GAGATTGTGA TTTTGTATG CAGGGTGATG ACAAATTAC TTGGTCTTT  
12410 12420 12430 12440 12450 12460 12470 12480 12490 12500  
TTACCTATGG GGATAATTAT TGATGGAAT CCTGAACTA ATCCACCCAT CAGAGTTCCA TACATTGGGT CTAGAACAGA GGAAGAAGA GTTGCATCAA  
12510 12520 12530 12540 12550 12560 12570 12580 12590 12600  
TGGCATATAT TAAAGGTGCC ACACACAGTT TGAAGGCTGC TCTTAGGGGT GCAGGGGTAT ATATTGGGC ATTCGGGGAT ACTATAGTGA ACTGGAATGA  
12610 12620 12630 12640 12650 12660 12670 12680 12690 12700  
TGCACTTGAT ATTGCAATA CTAGAGTTAA GATATCCCTA GAGCAACTTC AGACTCTCAC ACCTCTTCTT ACATCTGCAA ACATTACACA CCGTTTAGAT  
12710 12720 12730 12740 12750 12760 12770 12780 12790 12800  
GATGGAGCCA CAACACTTAA ATTCACTCCA GCTAGTTTCT ATGCATTTTC TAGTTACT CATATATCAA ATGATCAACA ATATTAGAA ATAGATCAGA  
12810 12820 12830 12840 12850 12860 12870 12880 12890 12900  
GAGTAGTTGA TTCCAATATT ATTTATCAAC AATTAATGAT AACAGGACTT GGGATTATTG AGACCTACCA TAACCCACCT ATAAGAACTT CTACACAAGA  
12910 12920 12930 12940 12950 12960 12970 12980 12990 13000  
AATCACTCTC CATTTCACA CTAGCTCATC TTGTGTGTGTT AGAAGTGTAG ATGGCTGCCT TATATGTGAA AGCAATGGAG AGGTTCCTCA GATCACTGTT  
13010 13020 13030 13040 13050 13060 13070 13080 13090 13100  
CCCTATACTA ATACATTGTT ATATGATCCT GACCCACTAG CAGATTATGA GATTGCACAT CTAGATTACC TCTCCTACCA AGCTAAAATT GGAAGTACAG  
13110 13120 13130 13140 13150 13160 13170 13180 13190 13200  
ATTACTACTC ACTCACTGAT AAAATTGACC TATTAGCACA TTAACTGCA AAACAAATGA TAAACTCAAT AATTGGGTTA GATGAAACAG TATCGATTGT  
13210 13220 13230 13240 13250 13260 13270 13280 13290 13300  
CAATGATGCG GTTATCCTAT CTGACTATAC TAATAACTGG ATTAGTGAAT GTTCTTATAC TAAATAGAT CTAGTTTITA AATTAATGGC ATGGAATTTT  
13310 13320 13330 13340 13350 13360 13370 13380 13390 13400  
CTTCTTGAGC TTGCATTCCA GATGTACTAC TTAAGGATAT CATCTTGGAC AAATATATT GACTATACCT ACATGACTTT ACGCAGAATA CCCGAACTG  
13410 13420 13430 13440 13450 13460 13470 13480 13490 13500  
CTCTAAATAA TATTGCAGCT ACTATTAGCC ATCCAAATTT ACTGAGACGT GCAATGAATC TTGATATTAT CACTCCTATA CATGCACCGT ATCTAGCTTC  
13510 13520 13530 13540 13550 13560 13570 13580 13590 13600  
ATTAGATTAT GTCAAATTAA GTATTGATGC AATTCAGTGG GGAGTTAAAC AAGTCTTTCG TGATTATCA AATGGAATTG ATCTTGAAAT CTTGATTCTT  
13610 13620 13630 13640 13650 13660 13670 13680 13690 13700  
TCAGAGGATT CAATGGAAAT TAGTGATAGG GCAATGAATC TCATTGCTAG AAACTAACT CTCCTTGAC TTGTTAAAGG TGAGAACTAC ACTTTTCCAA  
13710 13720 13730 13740 13750 13760 13770 13780 13790 13800  
AAATTAAGG GATGCCACCA GAAGAAAAGT GTTAGTCTT AACTGAATAT CTAGCAATGT GTTATCAAAA TACTCACCAC TTAGATCCAG ATCTTCAAAA  
13810 13820 13830 13840 13850 13860 13870 13880 13890 13900  
GTATTTATAT AATCTAACTA ATCCAAATTT GACCGCATTT CCCAGTAACA ACTTCTACTT AACTAGGAAA ATCCTCAATC AAATTAGAGA ATCAGACGAA  
13910 13920 13930 13940 13950 13960 13970 13980 13990 14000  
GGACAATATA TTATCACCTC ATATTATGAA TCCTTCGAAC AATTAGAAAC AGATATAATT CTTTATCTA CTTTAACTGC TCCTTATGAT AATTCAGAAA  
14010 14020 14030 14040 14050 14060 14070 14080 14090 14100  
CTCTAACAAA GTTTGATTTA TCCTTGACA TCTTTCCACA TCCAGAATCT CTCGAGAAAT ATCCTCTTCC AGTTGATCAT GACTCTCAAT CTGCAATTC  
14110 14120 14130 14140 14150 14160 14170 14180 14190 14200  
AACACTAATT CCAGGCCCTC CTTCTCATCA TGTATTACGA CCACTGGGAG TGCTCTCTAC AGCTTGATAT AAAGGGATAA GTTATTGTAG GTATCTAGAA  
14210 14220 14230 14240 14250 14260 14270 14280 14290 14300  
ACACAAAGA TACAGACTGG TGATCATCTT TATTTAGCTG AAGGAAGCGG CGCTTCAATG TCACTCCTAG AACTCCTATT TCCAGGAGAT ACTGTCTATT  
14310 14320 14330 14340 14350 14360 14370 14380 14390 14400  
ATAATAGTCT TTTTAGTAGT GGAGAGAATC CTCCACAGAG AAACACAGCC CCTCTTCCAA CTCAATTTGT ACAGAGTGT CCATATAAAT TGTGCAAGC  
14410 14420 14430 14440 14450 14460 14470 14480 14490 14500  
TGATCTTGCT GATGATAGCA ACTTGATAAA AGATTTTGTG CCATTAGGA ATGGAATGG TGCAGTTACA GACTTATCAA CAAAGGATGC AGTTGCATTCT

FIGURE 10E

|             |            |            |            |             |            |            |            |            |            |
|-------------|------------|------------|------------|-------------|------------|------------|------------|------------|------------|
| 14510       | 14520      | 14530      | 14540      | 14550       | 14560      | 14570      | 14580      | 14590      | 14600      |
| ATAATACATA  | AAGTAGGAGC | AGAAAAAGCA | TCTCTTGTCC | ATATAGATCT  | CGAATCGACT | GCTAATATAA | ATCAGCAAAC | TCTGTCCAGA | TCCCAGATTC |
| 14610       | 14620      | 14630      | 14640      | 14650       | 14660      | 14670      | 14680      | 14690      | 14700      |
| ATTCATTAAAT | TATAGCAACT | ACTGTTCTTA | AGAGGGGTGG | GATATTAAAT  | TATAAGACAT | CATGGCTTCC | TTTTTCTAGA | TTTAGTCAAC | TAGCAAGCCT |
| 14710       | 14720      | 14730      | 14740      | 14750       | 14760      | 14770      | 14780      | 14790      | 14800      |
| TCCTTTGGTGC | TTTTTTGACC | GGATCCATCT | AATACGTAAG | AGCTATTCTG  | ATCCTCACAG | TCATGAGGTT | TATCTTGTAT | GTAGACTTGC | CGCAGATTTT |
| 14810       | 14820      | 14830      | 14840      | 14850       | 14860      | 14870      | 14880      | 14890      | 14900      |
| AGAACTATCG  | GTTTCAGTGC | AGCTCTAGTA | ACTGCTACTA | CTCTTCACAA  | TGACGGATTC | ACAACAATAC | ATCCTGATGT | TGTTTGTAGT | TATTGGCAAC |
| 14910       | 14920      | 14930      | 14940      | 14950       | 14960      | 14970      | 14980      | 14990      | 15000      |
| ACCATCTTGA  | AAATGTTGGG | AGAGTCGGAA | AAGTAATTGA | TGAGATACTT  | GATGGTTTAG | CCACCAACTT | CTTTGCAGGA | GATAATGGAC | TTATTCTAAG |
| 15010       | 15020      | 15030      | 15040      | 15050       | 15060      | 15070      | 15080      | 15090      | 15100      |
| ATGTGGAGGA  | ACTCCCAGCT | CCAGAAAATG | GTTGGAGATT | GACCAAGTTAG | CATCATTTGA | TTTGGTTCAA | GATGCTCTGG | TGACACTTAT | CACTATACAC |
| 15110       | 15120      | 15130      | 15140      | 15150       | 15160      | 15170      | 15180      | 15190      | 15200      |
| CTAAAGGAAA  | TTATAGAAGT | GCAATCATCA | CATACAGAAG | ATTATACATC  | TCTCCTCTTC | ACACCTTATA | ATATTGGTGC | AGCAGGGAAA | GTTAGAACTA |
| 15210       | 15220      | 15230      | 15240      | 15250       | 15260      | 15270      | 15280      | 15290      | 15300      |
| TCATCAAAT   | AATTCTAGAA | CGATCTTTAA | TGTATACAGT | CCGAAATTGG  | TTAGTGTTAC | CCAGTTCCAT | CCGGGATTCT | GTACGACAAG | ATTTGGAATT |
| 15310       | 15320      | 15330      | 15340      | 15350       | 15360      | 15370      | 15380      | 15390      | 15400      |
| AGGGTCATTT  | AGATTAATGT | CTATTTTAAG | TGAACAGACA | TTTCTTAAAA  | AGACACCCAC | AAAAAATAC  | TACTTGATC  | AGCTTACAAG | GACATATATA |
| 15410       | 15420      | 15430      | 15440      | 15450       | 15460      | 15470      | 15480      | 15490      | 15500      |
| TCAACCTTCT  | TTAACTCTCA | CTCAGTCCTT | CCTCTTCACC | GTCCATATCA  | AAACAAATA  | TGGAAAGCCT | TAGGTAGTGT | AATATATTGT | TCGGAGACAG |
| 15510       | 15520      | 15530      | 15540      | 15550       | 15560      | 15570      | 15580      | 15590      | 15600      |
| TTGATATACC  | TCTAATTAAA | GACATTCAGA | TAGAAGATAT | TAATGATTTT  | GAGGATATCG | AGAGGGGTAT | CGATGGCGAA | GAATTATGAC | AACAATGATT |
| 15610       | 15620      | 15630      | 15640      | 15650       |            |            |            |            |            |
| ATAAGAAGCT  | ATGATAGTTT | TATTTAAGAA | AAACATATTG | ATTTTCCCCT  | TGGT       |            |            |            |            |

Human Parainfluenza Virus Type 2 Strain Greer, antigenomic sense cDNA Sequence Range: 1 to 15654

|            |            |            |            |            |            |            |             |             |             |
|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
| 10         | 20         | 30         | 40         | 50         | 60         | 70         | 80          | 90          | 100         |
| ACCAAGGGGA | GAATCAGATG | GCATCGTTAT | ATGACGAATT | GCAAAAAGAT | TACGTAGGTC | CGGAACCACT | AGATTCCGGT  | GCCGGTAACG  | ATTCCAGTTT  |
| 110        | 120        | 130        | 140        | 150        | 160        | 170        | 180         | 190         | 200         |
| TATACATCT  | GATCATCTC  | TATCTCTATT | AAGGATATTT | CTAGTCTAAA | GTTCAAAATG | TCAAGTGTTC | TAAAGACATT  | TGAAAGATTT  | ACTATACAAC  |
| 210        | 220        | 230        | 240        | 250        | 260        | 270        | 280         | 290         | 300         |
| AGGAGCTTCA | GGAGCAATCT | GATGACACTC | CAGTACCTCT | TGAGACAATC | AAACCTACAA | TCAGGGTATT | TGTCATCAAT  | AATAATGATC  | CTGTCTGTAAG |
| 310        | 320        | 330        | 340        | 350        | 360        | 370        | 380         | 390         | 400         |
| ATCTAGACTT | TTATTCTTTA | ATCTACGAAT | CATTATGAGT | AACACTGCAG | GAGAGGGACA | TAGAGCTGGT | GCTCTCTCTA  | GTCTTTTATC  | ACTACCTTCT  |
| 410        | 420        | 430        | 440        | 450        | 460        | 470        | 480         | 490         | 500         |
| GCAGCTATGA | GTAATCACAT | CAAATTAGCC | ATGCATTAC  | CAGAAGCCAG | CATAGATAGA | GTAGAGATAA | CAGGGTTTGA  | GAATAATTCA  | TTCGGAGTCA  |
| 510        | 520        | 530        | 540        | 550        | 560        | 570        | 580         | 590         | 600         |
| TTCCAGATGC | TCGATCAACT | ATGTCCAGAG | GAGAGGTGCT | GGCTTTTGAA | GCATTAGCTG | AGGACATTCC | TGATACCCTT  | AATCACCAAA  | CTCCATTTGT  |
| 610        | 620        | 630        | 640        | 650        | 660        | 670        | 680         | 690         | 700         |
| AAATAATGAT | GTAGAAGATG | ACATATTTGA | TGAAACAGAG | AAATCTTTAG | ATGTTTGCTA | CAGTGTGCTT | ATGCAGGCAT  | GGATAGTAAC  | ATGCAAGTGT  |
| 710        | 720        | 730        | 740        | 750        | 760        | 770        | 780         | 790         | 800         |
| ATGACTGTCT | CTGATCAACC | ACCAGTATCA | GTAGCAAAAG | GGATGGCTAA | ATATCAACAA | CAAGGGAGAA | TCAATGCTAG  | GTATGTACTA  | CAACCTGAAG  |
| 810        | 820        | 830        | 840        | 850        | 860        | 870        | 880         | 890         | 900         |
| CACAAAGACT | AATTCAGAA  | GCCATCCGCA | AGTCAATGGT | AGTAAGGCAT | TTCATGACTT | ATGAGCTTCA | ACTTTTCACA  | TCAAGATCTT  | TGCTAGCAAA  |
| 910        | 920        | 930        | 940        | 950        | 960        | 970        | 980         | 990         | 1000        |
| CCGTACTAT  | GCTATGGTGG | GAGACATTGG | CAAGTACATT | GAACACAGCG | GAATGGGAGG | ATTTTCTCTA | ACACTTAAAT  | ATGGACTTGG  | AACAAGATGG  |
| 1010       | 1020       | 1030       | 1040       | 1050       | 1060       | 1070       | 1080        | 1090        | 1100        |
| CCTACATGG  | CTCTTGACAG | ATTTTCTGGG | GAATCCAGAG | AATTAAGGCT | TCTCATGCTA | CATTATCAGA | GTCTAGGACC  | CATGGCCAA   | TACATGGCTC  |
| 1110       | 1120       | 1130       | 1140       | 1150       | 1160       | 1170       | 1180        | 1190        | 1200        |
| TATTAGAATC | ACCAAACTG  | ATGGATTTTG | TCCCATCTGA | ATATCCATTA | GTTTATAGCT | ATGCAATGGG | TATTGGAAC   | GTCCCTTGATA | CAAATATGAG  |
| 1210       | 1220       | 1230       | 1240       | 1250       | 1260       | 1270       | 1280        | 1290        | 1300        |
| AAATTATGCA | TACGGTAGAT | CATATTTAAA | TCCGCAATAT | TTTCAGCTAG | GAGTAGAAAC | AGCAAGGAAA | CAGCAGGGAG  | CTGTTGACAA  | CAGGACAGCA  |
| 1310       | 1320       | 1330       | 1340       | 1350       | 1360       | 1370       | 1380        | 1390        | 1400        |
| GAGGACCTCG | GCATGACTGC | TGCAGACAAA | GCAGACCTCA | CTGCAACCAT | ATCAAAGCTA | TCCTTGTCCT | AATTACCTAG  | GGGTAGACAA  | CCAATATCTG  |
| 1410       | 1420       | 1430       | 1440       | 1450       | 1460       | 1470       | 1480        | 1490        | 1500        |
| ACCCATTGTC | TGGAGCAAAT | GACAGAGAAA | TGGGAGGACA | AGCAATGAT  | ACACCTGTGT | ATAACTTCAA | TCCAATCAAT  | ACTCGGAGGT  | ATGACAACTA  |
| 1510       | 1520       | 1530       | 1540       | 1550       | 1560       | 1570       | 1580        | 1590        | 1600        |
| TGACAGTGAT | GGTGAGGACA | GAATTGACAA | CGATCAAGAT | CAAGCTATCA | GAGAGAATAG | AGGAGAGCCT | GGACAACCAA  | ACAACCAGAC  | AAGTGACAAC  |
| 1610       | 1620       | 1630       | 1640       | 1650       | 1660       | 1670       | 1680        | 1690        | 1700        |
| CAGCAGAGAT | TCAACCCCCC | CATACCGCAA | AGAATCATAG | GTATGAGCAG | TGAAGAGTTC | CAACATTCAA | TGAATCAGTA  | CATCCGTGCT  | ATGCATGAGC  |
| 1710       | 1720       | 1730       | 1740       | 1750       | 1760       | 1770       | 1780        | 1790        | 1800        |
| AATACAGAGG | CTCCCAGGAT | GATGATGCCA | ATGATGCCAC | AGATGGGAAT | GACATTCTCT | TTGAGCTAGT | TGGAGATTTT  | GATTCCCTAAC | TCTCAATGTC  |
| 1810       | 1820       | 1830       | 1840       | 1850       | 1860       | 1870       | 1880        | 1890        | 1900        |
| ATACAACCCG | ATATACACAT | CCACATCACT | CAGAGATACA | GCTGCCACTC | ACACACTCAT | CCAGACAAAT | CAAACCTAGAC | TCACATCATT  | CGGAACAAT   |
| 1910       | 1920       | 1930       | 1940       | 1950       | 1960       | 1970       | 1980        | 1990        | 2000        |
| TCTCTCATAA | TTTAAGAAAA | AATCATAGGC | CCGGACGGGT | TAGAAATCCG | GTGCTTGTTT | GTGATCAGAT | AACCTCCACA  | CCAGAATCAT  | ACAATCATGG  |
| 2010       | 2020       | 2030       | 2040       | 2050       | 2060       | 2070       | 2080        | 2090        | 2100        |
| CCGAGGAACC | AACATACACC | ACTGAGCAAG | TTGATGAATT | AATCCATGCT | GGACTGGGAA | CAGTAGATTT | CTTCCTATCT  | AGACCCATAG  | ATGCTCAGTC  |
| 2110       | 2120       | 2130       | 2140       | 2150       | 2160       | 2170       | 2180        | 2190        | 2200        |
| TTCTTTAGGC | AAAGGCAGCA | TCCCACCAAG | TGTCACAGCT | GTTCTAACTA | GTGCAGCGGA | GGCAAAATCC | AAACCAAGTT  | CTGCTGGTCC  | AGTTAAACCC  |
| 2210       | 2220       | 2230       | 2240       | 2250       | 2260       | 2270       | 2280        | 2290        | 2300        |
| AGGCGGAAGA | AAGTGATCAG | CAATACTACT | CCATACACTA | TTGCAGACAA | TATTCCACCT | GAGAAGCTAC | CGATCAACAC  | TCCAATACCC  | AATCCATTAC  |
| 2310       | 2320       | 2330       | 2340       | 2350       | 2360       | 2370       | 2380        | 2390        | 2400        |
| TTCCACTGGC | ACGCCCTCAC | GGAAAGATGA | CAGACATTGA | CATTGTCACT | GGGAACATTA | CAGAAGGATC | GTACAAAGGT  | GTGGAGCTTG  | CTAAATTAGG  |
| 2410       | 2420       | 2430       | 2440       | 2450       | 2460       | 2470       | 2480        | 2490        | 2500        |
| GAAGCAGACA | CTACTCACA  | GGTTCACCTC | GAATGAGCCA | GTCTCCTCAG | CTGGATCCGC | CCAAGACCCC | AACTTTAAGA  | GGGGGGGAGC  | TAATAGAGAA  |
| 2510       | 2520       | 2530       | 2540       | 2550       | 2560       | 2570       | 2580        | 2590        | 2600        |
| AGAGCAAGAG | GCAACCATAG | GAGAGAATGG | AGTATTGCAT | GGGTCCGAGA | TCAGGTCAAA | GTCTTCGAGT | GGTGAATCC   | CAGGTGTGCC  | CCAGTCACGG  |
| 2610       | 2620       | 2630       | 2640       | 2650       | 2660       | 2670       | 2680        | 2690        | 2700        |
| CCTCAGCTCG | CAAGTTCACC | TGCATATGCG | GATCCTGCCC | CAGCATCTGC | GGAGAATGTG | AAGGAGATCA | TTGAGCTCTT  | AAAGGGACTT  | GATCTTCGCC  |
| 2710       | 2720       | 2730       | 2740       | 2750       | 2760       | 2770       | 2780        | 2790        | 2800        |
| TTCAGACTGT | AGAAGGAAA  | GTAGATAAAA | TTCTTGCAAC | TTCTGCAACT | ATAATCAATC | TTAAAAATGA | AATGACTAGT  | CTCAAGGCGA  | GTGTGCAAC   |
| 2810       | 2820       | 2830       | 2840       | 2850       | 2860       | 2870       | 2880        | 2890        | 2900        |
| TGTGGAAGGT | ATGATAACAA | CAATTAATAA | CATGGATCCC | AGTACACCAA | CTAATGTCCC | TGTAGAGGAG | ATCAGAAAAG  | GTTTACACAA  | TGTTCCAGTA  |

FIGURE 11A

```

2910      2920      2930      2940      2950      2960      2970      2980      2990      3000
GTAATTGCCG GTCCAAC TAGGAGGCTT ACAGCCGAAG GCAGTGATAT GATTTC AATG GATGAAC TAGACCTAC ACTCTCATCA AAAAAAGGA

3010      3020      3030      3040      3050      3060      3070      3080      3090      3100
TCACACGAAA GCCTGAATCC AAGAAAGATT TAACAGGCAT AAAACTAACT TTGATGCAGC TTGCAATGA CTGCATCTCG CGTCCAGATA CCAAGACTGA

3110      3120      3130      3140      3150      3160      3170      3180      3190      3200
GTTCTGTGACT AAGATTGAGG CAGCAACCCAG AGAATCACAG CTTAACGAAA TTAACGGTTC AATAATACGC TCTGCAATAT AAAATGAGGT GCAGTCACAC

3210      3220      3230      3240      3250      3260      3270      3280      3290      3300
AAGAGAGACT CAACATGCTC CCAATCAAGA TCCAGACTCC ATCCATCCAA AAACAGCGCC ACAATTGTCA ACACCAAGAA ACAACCACAG CCGAACCATTG

3310      3320      3330      3340      3350      3360      3370      3380      3390      3400
CTCAACCAAA AGACCCAAAC AACACCTCAC ATCAATAGAA GGCTGGACAT GATAAATTTA ATAAAAAAG AAAAGAAGTT AAGTAAATTT TAAAGGACAC

3410      3420      3430      3440      3450      3460      3470      3480      3490      3500
AATAGAGAAA ATCTAGGTCC GAAAGCTTGC CTCTCAGACA GATCCCAAAA TCATAGTCCA AACCCCAAAC ACAGCAGCAG ACATGCCCTAT AATATCATTAA

3510      3520      3530      3540      3550      3560      3570      3580      3590      3600
CCAGCAGATC CAACTTCACC CAGTCAATCC CTTACTCCGT TTCCAATACA ACTTGACACC AAAGATGGGA AGGCAGGGAA ACTCCTTAAA CAGATTTCGAA

3610      3620      3630      3640      3650      3660      3670      3680      3690      3700
TTAGGTATCT AAATGAGCCT AATTCTCGCC ATACACCAAT AACTTTTATC AATACGTATG GATTGTGTTA TGCTCGAGAC ACTTCAGGGG GCATTTCACAG

3710      3720      3730      3740      3750      3760      3770      3780      3790      3800
TGAGATCAGC AGTGACCTAG CTGCAGGGTC CATAACAGCA TGATGATGTA CGCTAGGTCC TGGTCCAAAT ATTCAGAAAT CAAATCTAGT GCTAAGATCT

3810      3820      3830      3840      3850      3860      3870      3880      3890      3900
CTGAATGAAT TCTACGTAAA AGTCAAGAAG ACATCAAGCC AGAGAGAGGA AGCAGTGTTC GAATTAGTTA ACATTCCAAC TTTATTGAGA GAACATGCTC

3910      3920      3930      3940      3950      3960      3970      3980      3990      4000
TTTGCAACCG CAAAATGTTA GTATGCTCTG CAGAAAAATT CCTCAAGAAC CCGTCAAAGC TACAAGCTGG ATTTGAGTAT GTATACATAC CAACTTTTGT

4010      4020      4030      4040      4050      4060      4070      4080      4090      4100
CTCCATTACA TACTCACCAC GAAATCTGAA TTACCAAGTT GCCAGACCTA TCCTTAAGTT CAGATCACGC TTTGTGTATA GCATTCAATT GGAATTAATC

4110      4120      4130      4140      4150      4160      4170      4180      4190      4200
CTGAGATTGC TAGCAAATC TGACTCCCCC TTGATGAAAT CCTACAATGC AGACAGAAAC GGTCGGGGAT GCCTCGCATC AGTCTGGATC CTTGTATGTA

4210      4220      4230      4240      4250      4260      4270      4280      4290      4300
ACATTCTGAA AAACAAAAGC ATCAAGCAAC AAGGCAGAGA ATCATATTTC ATAGCTAAGT GCATGAGCAT GCAGCTGCAG GTGTCCATTG CAGATCTTTG

4310      4320      4330      4340      4350      4360      4370      4380      4390      4400
GGGACCAACA ATCATAATCA AATCATTTGG TCACATCCCC AAGACTGCAC TTCCTTTTTC CAGCAAAGAT GGGATTGCCT GTCATCCATT ACAAGATGTT

4410      4420      4430      4440      4450      4460      4470      4480      4490      4500
TCCCTTAATC TGACAAAATC ACTGTGGTCA GTTGGATGTG AGATAGAATC TGCCAAGTTG ATACTTCAAG AATCTGATCT TAATGAGCTA ATGGGCCACC

4510      4520      4530      4540      4550      4560      4570      4580      4590      4600
AGGACCTTAT CACTGATAAG ATTGCCATTA GATCAGGTCA ACGGACATTT GAGAGGTCCA AATTCAGCCC ATTCAAAAAA TATGCATCAA TTCCAACCTT

4610      4620      4630      4640      4650      4660      4670      4680      4690      4700
GGAAGCCATC AACTGAATGC TCCAGCATCT GAGAATAGAA CCACAATCAA GTCATACTAC TAGTCACTAT ACAATAATCA ACAATTTTAG TCAACTGATT

4710      4720      4730      4740      4750      4760      4770      4780      4790      4800
ACCAAGATGT TATCATAGGT CCGAAGCTGAT CAATCTAACA AAAAAACTAA ACGTTCACCA ATAAATCAAC GTTCAGGCCA AAATATTTCAG CCATGCATCA

4810      4820      4830      4840      4850      4860      4870      4880      4890      4900
CCTGCATCCA ATGATAGTAT GCATCTTTGT TATGTACACT GGAATTGTAG GTTCAGATGC CATTGCTGGA GATCAACTAC TTAATATAGG GGTCAATTCA

4910      4920      4930      4940      4950      4960      4970      4980      4990      5000
TCAAAGATAA GATCACTCAT GTACTATACT GATGGTGGTG CTAGCTTTAT TGTGTGAAAA TTGCTACCTA ATCTTCCCCC AAGCAATGGA ACATGCAACA

5010      5020      5030      5040      5050      5060      5070      5080      5090      5100
TCACCACTCT AGATGCATAT AATGTTACCC TATTTAAGTT ACTAACACCC CTGATTGAGA ACCTGAGTAA AATTTCCTACT GTTACAGATA CCAAAAACCCG

5110      5120      5130      5140      5150      5160      5170      5180      5190      5200
CCAAGAACGA TTTGCAGGAG TAGTTGTGGG ACTTGCTGCA TTAGGAGTAG CCACAGCCGC ACAAATAACT GCAGCTGTAG CAATAGTGAA AGCTAATGCA

5210      5220      5230      5240      5250      5260      5270      5280      5290      5300
AATGCTGCTG CGATAAACAA TCTTGCATCT TCAATTCAAT CCACCAACAA GGCAGTATCC GATGTGATAG ATGCATCAAG AACAATTGCA ACCGAGTTTC

5310      5320      5330      5340      5350      5360      5370      5380      5390      5400
AAGCAATTCA GGATCACATC AATGGAGCTA TTGTTAATGG GATAACATCT GCATCATGCC GTGCCCATGA TGCACTCATT GGTCAATAT TAAATCTTTA

5410      5420      5430      5440      5450      5460      5470      5480      5490      5500
TCTCACTGAG CTTACCACAA TATTTCAATA TCAAAATAACA AACCTGCGC TGACACCACT CTCCATCCAA GCTTTAAGAA TCCTCTCTCG TAGCACCTTG

5510      5520      5530      5540      5550      5560      5570      5580      5590      5600
CCAATTGTCA TTGAGTCCAA ACTCAACACA AACCTCAACA CAGCAGAGCT GCTCAGTTCC GGACTGTGTA CTGGTCAAAAT AATTTCCTATT TCCCCAATGT

5610      5620      5630      5640      5650      5660      5670      5680      5690      5700
ACATGCAAAAT GCTAATTCAA ATCAATGTTT CGACATTTAT AATGCAACCC GGTGCGAAGG TAATTGATCT AATTGCTATC TCCGCAAAAC ATAAATTGCA

5710      5720      5730      5740      5750      5760      5770      5780      5790      5800
AGAAGTGTTT GTACAAGTTC CGAATAGGAT TCTAGAGTAT GCAAAATGAC TACAAAATTA CCCAGCCAAT GACTGTGTCG TGACACCGAA CTCTGTATTT

```

FIGURE 11B

5810 5820 5830 5840 5850 5860 5870 5880 5890 5900  
TG TAGATACA ATGAGGGTTC CCCTATCCCT GAATCACAAT ATCAATGCTT GAGGGGGAAAT CTTAATTCTT GCACCTTTTAC CCCTATTATC GGGAACTTTT  
5910 5920 5930 5940 5950 5960 5970 5980 5990 6000  
TTAAGCGATT CGCATTGCT AATGGTGTGC TCTATGCCAA CTGCAAATCT TTGCTATGTA GGTGTGCCGA CCCCCCCCAT GTTGTATCCC AGGATGATAC  
6010 6020 6030 6040 6050 6060 6070 6080 6090 6100  
CCAAGGCATC AGCATAATTG ATATTAAGAG ATGCTCTGAG ATGATGCTTG ACACCTTTTC ATTTAGGATC ACATCTACTT TCAATGCTAC GTACGTGACA  
6110 6120 6130 6140 6150 6160 6170 6180 6190 6200  
GACTTCTCAA TGATTAATGC AAATATTGTA CATCTAAGTC CTCTAGATTT GTCAAATCAA ATCAATTCAA TAAACAAATC TCTTAAAGT GCTGAGGATT  
6210 6220 6230 6240 6250 6260 6270 6280 6290 6300  
GGATTGCAGA TAGCAACTTC TTTGCTAATC AAGCCAGGAC AGCCAGGACA CTTTATTTCAC TAAGTGCAAT AGCATTAAATA CTATCAGTGA TTACTTTGGT  
6310 6320 6330 6340 6350 6360 6370 6380 6390 6400  
TGTCGTGGGA TTGCTGATTG CCTACATCAT CAAGCTGGTT TCTCAAATCC ATCAATTGAC ATCGCTAGCT GCTACACAA TGTTCCACAG GAAAAATCCT  
6410 6420 6430 6440 6450 6460 6470 6480 6490 6500  
GCCCTCTTTT CCAAGAATAA CCATGGAAAC ATATATGGGA TATCTTAAGA AATCTATCAC AAGTCTATAT ATGTCCACAA TTGACCCCTA AGAACCAACT  
6510 6520 6530 6540 6550 6560 6570 6580 6590 6600  
TCCAACGATT ATCCGTTAAA TTAAAGTATA ATAGTTTAAA AATTAACATT AAGCCTCCAG ATACCAATGA ATATGAATAT ATCTCTTAGA AAACCTGATT  
6610 6620 6630 6640 6650 6660 6670 6680 6690 6700  
ATTATGTGAT AGCGTAGTAC AATTTAAGAA AAAACCTAAA ATAAGCAGCA ACCCTTAAGG TGTCGTAACG TCTCGTGACA CCGGTTTCAG TTCAAATATC  
6710 6720 6730 6740 6750 6760 6770 6780 6790 6800  
GACCTCTAAC CCAATTTAAC ACCCATCTCT ATATAAGAAC ACAGTATAAT TTAATCACA AAGACCTCAA AAATGACAC AGCTTGATCC ACTCAACATA  
6810 6820 6830 6840 6850 6860 6870 6880 6890 6900  
TAATTGTAAG ATTAATAATA ATGGAAGATT ACAGCAATCT ATCTCTTAAA TCAATTCTCA AAAGGACATG TAGAATCATT TTCCGAAGTG CCACAATTCT  
6910 6920 6930 6940 6950 6960 6970 6980 6990 7000  
TGGAATATGC ACATTGATTG TTCTATGTTT AAGTATTCTT CATGAGATAA TTCATCTTGA TGTTTCTCTT GGTCTCATGG ATTCGATGGA TTCACAGCAA  
7010 7020 7030 7040 7050 7060 7070 7080 7090 7100  
GGCATTATTC AGCCTATTAT AGAATCATTA AAATCATTA TTGCTTTGGC TAACCAGATT CTGTACAATG TTGCAATAAT AATTCCTCTT AAAATTGACA  
7110 7120 7130 7140 7150 7160 7170 7180 7190 7200  
GTATCGAGAC TGTAATATAC TCTGCTTTAA AGGATATGCA TACTGGGAGC ATGTCCCAACA CCAACTGTAC ACCCGGAAAT CTGCTTCTGC ATGATGCAGC  
7210 7220 7230 7240 7250 7260 7270 7280 7290 7300  
GTACATCAAT GGAATAAACA AATTCCTTGT ACTTAAATCA TACAATGGGA CGCCTAAATA TGGACCTCTC CTAAATATTC CCAGCTTTAT CCCCTCAGCA  
7310 7320 7330 7340 7350 7360 7370 7380 7390 7400  
ACATCTCCCA ACGGGTGCAC TAGAATACCA TCATTTTTCAC TCATTAAGAC CCATTGGTGT TACACTCACA ATGTAATACT TGGAGATTGC CTCGATTCTA  
7410 7420 7430 7440 7450 7460 7470 7480 7490 7500  
CGACATCTAA TCAATTTTAA GCAATGGGGA TAATACAACA ATCTGCTGCA GCATTTCCTCA TCTTCAGGAC TATGAAAACC ATTTACCTAA GTGATGGAAT  
7510 7520 7530 7540 7550 7560 7570 7580 7590 7600  
CAATCGCAAA AGCTGTTTCA TCACTGCTAT ACCAGGAGGT TGTGCTTGT ATTGCTATGT AGCTACAAGA TCTGAGAAAG AAGATTATGC CACAACATGAT  
7610 7620 7630 7640 7650 7660 7670 7680 7690 7700  
CTAGCTGAAC TGAGACTTGC TTTCTATTAT TATAATGATA CCTTTATTGA AAGAGTCATA TCTCTTCCAA ATACAACAGG GCAATGGGCC ACAATCAATC  
7710 7720 7730 7740 7750 7760 7770 7780 7790 7800  
CTGCACTGG AAGCGGGATC TATCATCTAG GCTTTATTTT ATTTCCCTGTA TATGGTGTC TCATAAAGGG GACTCCTTCC TACAACAAGC AGTCCCTCAGC  
7810 7820 7830 7840 7850 7860 7870 7880 7890 7900  
CTATTTTATC CCAAACATC CCAACATAAC CTGTGCCGGT AAATCCAGCG AACAGGTCGC AGCAGCACGG AGTTCCCTATG TAATCCGTTA TCACTCAAAC  
7910 7920 7930 7940 7950 7960 7970 7980 7990 8000  
AGGTTGATTC AGAGTGCTGT TCTTATTGCG CCATTGTCTG ACATGCACAC AGCAAGGTGT AATCTAGTTA TGTTTAACA TTTCTCAAGTC ATGATGGGTG  
8010 8020 8030 8040 8050 8060 8070 8080 8090 8100  
CAGAAGGTAG GCTCTATGTT ATTGACAATA ATTTGTATTA TTATCAACGT AGTTCCCTCT GGTGGGCTGC ATCGCTTTT TACAGGATCA ATACAGATT  
8110 8120 8130 8140 8150 8160 8170 8180 8190 8200  
TTCTAAAGGA ATTCCTCCTA TCATTGAGGC TCAATGGGTA CCGTCCCTATC AAGTTCCCGG TCCTGGAGTC ATGCCATGCA ATGCAACAAG TTTTGGCCCT  
8210 8220 8230 8240 8250 8260 8270 8280 8290 8300  
GCTAATTGCA TCACAGGGGT GTACGCAGAT GTGTGGCCGC TTAACGATCC AGAACCCACA TCACAAAATG CTCTGAATCC CAACATCGA TTGCTGGAG  
8310 8320 8330 8340 8350 8360 8370 8380 8390 8400  
CCTTTCTCAG AAATGAGTCC AACCGAACCA ATCCACATT CTACACTGCA TCAGCCAGCG CCCTACTAAA TACTACCGGA TTCAACAACA CCAATCACAA  
8410 8420 8430 8440 8450 8460 8470 8480 8490 8500  
AGCAGCATAT ACGTCTTCAA CCTGCTTTAA GAATACTGGA ACTCAAAAGA TTTATTGTTT GATAATAATT GAAATGGGCT CATCTCTTTT AGGGGAGTTC  
8510 8520 8530 8540 8550 8560 8570 8580 8590 8600  
CAAATAATAC CATTCTAAG GGAATAATA CCTTAATACT ATTGAATGAA GACTCCAGAT TCAATAATA TTGAAAGGCT CTCTATCTTA TGCAATAGTT  
8610 8620 8630 8640 8650 8660 8670 8680 8690 8700  
ATACGTTTTG GCTGTATTAG AATGTTATAG CATTCTGCTG TTTTCCCAT ATGAAGCAAT CCTCAACAC CGACTTAGGT TCAATTTTCT CATCATTTAC

FIGURE 11C

8710 8720 8730 8740 8750 8760 8770 8780 8790 8800  
TGTTGTAATT CAATCTTACT AAAGTTATTC CGATATTTAA GAAAAAATAA CCTTTATATA ATGTAACAAT ACTATTAAGA TTATGATATA GGCCAGAATG

8810 8820 8830 8840 8850 8860 8870 8880 8890 8900  
GCGGCCTCTT CTGAGACTACT CCTTCTGTAA GTCCACTTGA ACTCACCAAT AGTCAACAC AAACATATAT ACTACTTATT ACTAGGGCAC TTCCCGCATG

8910 8920 8930 8940 8950 8960 8970 8980 8990 9000  
ATCTTGACAT TTCTGAAATA AGCCCCCTTC ACAATAATGA TTGGGATCAA ATTGCCAGAG AAGAATCCAA TCTTGCTGAA CGACTTGGAG TAGCTAAATC

9010 9020 9030 9040 9050 9060 9070 9080 9090 9100  
TGAATTAATT AAACGTGTGC CCGCATTTAG AGCAACTAGA TGGCGTAGTC ATGCAGCCGT CCTTATATGG CCTTCTTGTA TACCATTCTT TGTAAATTC

9110 9120 9130 9140 9150 9160 9170 9180 9190 9200  
CTACCTCATT CTAAGCTTCA ACCAGTAGAA CAATGGTACA AGTTGATCAA TGCTTCATGT AATACTATAT CTGACTCAAT TGATAGATGT ATGGAGAATA

9210 9220 9230 9240 9250 9260 9270 9280 9290 9300  
TTTCTATTAA GCTTACTGGG AAAACAATC TATTCTCTCG ATCCAGAGGA ACTGCAGGTG CAGGTAAAAA CAGTAAAAAT ACCCTCAATG ATATCCAATC

9310 9320 9330 9340 9350 9360 9370 9380 9390 9400  
TATTTGGGAA TCAAAACAAGT GGCAACCTAA TGTATCTTTA TGGCTTACAA TTAATATACCA AATGCGACAA CTTATAATGC ATCAAAGTTC TCGTCAGCCG

9410 9420 9430 9440 9450 9460 9470 9480 9490 9500  
ACTGATTTAG TTCACATTGT TGACACACGA TCTGGTCTAA TAGTTATCAC CCCTGAACCT GTTATTTGTT TTGATCGGTT AAATAGTGT TTAATGTATT

9510 9520 9530 9540 9550 9560 9570 9580 9590 9600  
TTACATTGA GATGACTTTA ATGGTAAGTG ACATGTTTGA GGGAAGGATG AATGTCACCG CTCTCTGCAC TATTAGTCAT TACTTATCTC CACTAGGGCC

9610 9620 9630 9640 9650 9660 9670 9680 9690 9700  
AAGGATAGAT AGATTGTTTT CCATTGTAGA TGAATTAGCA CAACTATTAG GTGACACTGT ATATAAAGTT ATTGCATCTC TTGAATCTTT AGTATATGGG

9710 9720 9730 9740 9750 9760 9770 9780 9790 9800  
TGCTTACAAC TTAAAGATCC AGTAGTGGAA TTAGCAGGGT CATTTCATTC CTTTATTACA CAAGAGATTA TAGATATCCT AATTGGTTCA AAAGCCCTTG

9810 9820 9830 9840 9850 9860 9870 9880 9890 9900  
ATAAGGATGA ATCAATAACT GTTACTACAC AATTGTTAGA TATATTTTCC AACCTTCTC CAGATTTAAT TGCTGAGATG TTGTGTCTCA TGAGACTTTG

9910 9920 9930 9940 9950 9960 9970 9980 9990 10000  
GGGTCAATCC ACTCTTACTG CTGCGCAAGC TGCAGGTAAA GTGAGAGAAT CTATGTGTGC AGGTAAAGTTA CTTGATTTC CTACAATAAT GAAACCTCTT

10010 10020 10030 10040 10050 10060 10070 10080 10090 10100  
GCTTTTTTCC ACACAATTTT AATTAATGGT TACCCTAGAA AGAAAAATGG AATGTGGCCT CCACCTTATC TTCCTAAAAA TGCATCAAAA AGCTTAATAG

10110 10120 10130 10140 10150 10160 10170 10180 10190 10200  
AATTTCAACA TGATAATGCT GAAATATCTT ACGAATATAC ACTCAAGCAT TGGAAGAGA TCTCTCTCAT AGAATTTAGA AAGTGCTTTG ACTTTGATCC

10210 10220 10230 10240 10250 10260 10270 10280 10290 10300  
TGGTGAGGAG CTAAGCAATT TTATGAAGA CAAGGCAATA AGTGCTCCAA GAAGTGATTG GATGAGTGTA TTTCTGTAGAA GTCTAATAAA ACAACGACAT

10310 10320 10330 10340 10350 10360 10370 10380 10390 10400  
CAGAGACATC ATATTCCTAT GCCCAATCCA TTTAATAGAC GTCTATTACT CAATTTCCTA GAAGATGACA GTTTTGATCC AGTTGCCGAG CTTCAATATG

10410 10420 10430 10440 10450 10460 10470 10480 10490 10500  
TTACCAGTGG TGAATATCTC CAAGATGACA CATTTTGTC ATCTTACTCA TTAAAGAGA AAGAAATAAA ACCAGATGGA AGGATATTTG CTAAGCTTAC

10510 10520 10530 10540 10550 10560 10570 10580 10590 10600  
TAATAGATG CGGTCTGTG AAGTAATTGC GGAAGCAATT CTCGCAATC ATGCAGGTAC TCTAATGAAG GAAAACGGAG TTGTCTTGAA TCAATTATCA

10610 10620 10630 10640 10650 10660 10670 10680 10690 10700  
CTGACTAAAT CATTGCTTAC TATGAGTCAA ATTTGGCATA TATCAGAAAA GGCGAAGAGA TATACGCGAG ATAACATCTC ATCCCAAGGT TTCCATACAA

10710 10720 10730 10740 10750 10760 10770 10780 10790 10800  
TCAAGACTGA TTCTAAAAAT AAGAGGAAAA GCAAACTGC ATCATCATAC CTCACAGATC CTGATGATAC ATTTGAACTT AGTGCATGTT TTATAACTAC

10810 10820 10830 10840 10850 10860 10870 10880 10890 10900  
TGATCTTGCT AAATACTGTC TTCAATGGAG ATATCAGACC ATAATCCATT TTGCTCGAAC ATTAAACAGA ATGTATGGAG TTCCACATTT ATTTGAATGG

10910 10920 10930 10940 10950 10960 10970 10980 10990 11000  
ATTCACTTTC GTTTAATTAG ATCTACATTA TATGTTGGTG ATCCATTCAA TCCTCTGCC GCAACTGATG CTTTCGATCT AGATAAAGTA TTAAATGGTG

11010 11020 11030 11040 11050 11060 11070 11080 11090 11100  
ATATCTTTAT AGTCTCTCCC AAGGGAGGTA TTGAAGGCCT ATGTCAGAAA ATGTGGACAA TGATCTCTAT TTCTGTGATC ATCCTCTCTT CAGCCGAATC

11110 11120 11130 11140 11150 11160 11170 11180 11190 11200  
CAAAACAAGA GTAATGAGCA TGGTTCAAGG AGATAATCAG GCGATTGCG TTAACAACAG AGTTCTCTAG TCATTACCTA GTATTGAGAA AAAGGAGTTA

11210 11220 11230 11240 11250 11260 11270 11280 11290 11300  
GCCTATGCG CAAGCAAGTT ATTTTGTGAA AGACTTAGGG CAAATAATTA TGGGTTGGGT CATCAGCTAA AGGCTCAAGA AACTATAATA AGTTCCACGT

11310 11320 11330 11340 11350 11360 11370 11380 11390 11400  
TCTTCATATA TAGTAAACGG GTATTTTATC AAGGACGTAT ACTAACACAG GCACTCAAAA ATGCTAGCAA GTTATGTCTT ACTGCAGATG TATTAGGTGA

11410 11420 11430 11440 11450 11460 11470 11480 11490 11500  
ATGTACTCAA GCTTCTGTG CAAATTCGCT TACTACCATC ATGAGATTAA CAGAAAATGG GGTGAGAAA GATACATGTT ATAAGCTTAA TATTATCAG

11510 11520 11530 11540 11550 11560 11570 11580 11590 11600  
TCCATTCGTC AACTCACATA TGATCTAATA TTTCCCAAT ACTCCATACC AGGTGAAACT ATAAGTGAGA TTTTCTTACA GCATCCAAGA CTAATCTCAC

FIGURE 11D

|             |             |            |            |             |            |            |            |             |             |
|-------------|-------------|------------|------------|-------------|------------|------------|------------|-------------|-------------|
| 11610       | 11620       | 11630      | 11640      | 11650       | 11660      | 11670      | 11680      | 11690       | 11700       |
| GTATTGTTCT  | GCTCCCTTCA  | CAGCTAGGTG | GTCTTAATTA | CCTCGCATGT  | AGCAGATTAT | TTAACCCGAA | TATCGGAGAT | CCTCTTGGTA  | CAGCTGTGGC  |
| 11710       | 11720       | 11730      | 11740      | 11750       | 11760      | 11770      | 11780      | 11790       | 11800       |
| AGATCTCAAG  | AGGTTAATTA  | AATGTGGTGC | TCTTGAATCA | TGGATACTGT  | ATAATTTACT | AGCAAGAAAA | CCAGGGAAAG | GTTCATGGGC  | AACTTTAGCA  |
| 11810       | 11820       | 11830      | 11840      | 11850       | 11860      | 11870      | 11880      | 11890       | 11900       |
| GCCGATCCAT  | ACTCATTGAA  | TCAAGAATAT | CTTTATCCTC | CTACTACTAT  | ACTTAAAGA  | CATACTCAAA | ATACTTTAAT | GGAGATATGT  | CGGAATCCTA  |
| 11910       | 11920       | 11930      | 11940      | 11950       | 11960      | 11970      | 11980      | 11990       | 12000       |
| TGTTAAAGGG  | AGTTTTTACA  | GATAATGCAA | AAGAGGAGGA | AAATCTCCTT  | GCAAAATTTC | TTCTTGATCG | TGATATAGTA | TTGCCAAGAG  | TTGCACACAT  |
| 12010       | 12020       | 12030      | 12040      | 12050       | 12060      | 12070      | 12080      | 12090       | 12100       |
| TATAATAGAT  | CAATCTAGCA  | TCGGAAGGAA | GAAACAGATA | CAAGGATTTT  | TTGACACCAC | AAGGACCATA | ATGAGACGAT | CATTTGAAAT  | CAAACCACTC  |
| 12110       | 12120       | 12130      | 12140      | 12150       | 12160      | 12170      | 12180      | 12190       | 12200       |
| TCAACTAAGA  | AGACTCTTTC  | AGTCATAGAA | TATAATACTA | ATTACTTATC  | TTATAACTAC | CCTGTCATAC | TTAATCCTTT | ACCTATTCTC  | GGATATTATA  |
| 12210       | 12220       | 12230      | 12240      | 12250       | 12260      | 12270      | 12280      | 12290       | 12300       |
| ATTATATTAC  | TGACCAAACT  | TGCAGTATTG | ATATATCTAG | AAGTTTAAGA  | AAATTATCAT | GGTCTTCTTT | ATTGAATGGA | AGAACCTTAG  | AAGGATTAGA  |
| 12310       | 12320       | 12330      | 12340      | 12350       | 12360      | 12370      | 12380      | 12390       | 12400       |
| AACCTCCAGAT | CCAATTGAAG  | TTGTCAATGG | TTCTTGTGAT | GTAGGTACAG  | GAGATTGTGA | TTTTTGTATG | CAGGGTGACG | ACAAATTTAC  | TTGGTTCTTT  |
| 12410       | 12420       | 12430      | 12440      | 12450       | 12460      | 12470      | 12480      | 12490       | 12500       |
| TTACCTATGG  | GGATAATTAT  | TGATGGAAAT | CCTGAAACTA | ATCCACCCAT  | CAGAGTTCCA | TACATTGGGT | CTAGAACAGA | GGAAAGAAGA  | GTTGCATCAA  |
| 12510       | 12520       | 12530      | 12540      | 12550       | 12560      | 12570      | 12580      | 12590       | 12600       |
| TGGCATATAT  | TAAAGGTGCC  | ACACACAGTT | TGAAGGCTGC | TCTTAGAGGC  | GCAGGGGTAT | ATATTTGGGC | ATTCGGGGAT | ACTGTAGTGA  | ACTGGAATGA  |
| 12610       | 12620       | 12630      | 12640      | 12650       | 12660      | 12670      | 12680      | 12690       | 12700       |
| TGCACCTTAT  | ATCGCAATAA  | CTAGGGTTAA | GATATCCCTA | GAGCAACTTC  | AGACCCCTAC | ACCTCTCTCT | ACATCTGCAA | ACATTACACA  | CCGTTTAGAT  |
| 12710       | 12720       | 12730      | 12740      | 12750       | 12760      | 12770      | 12780      | 12790       | 12800       |
| GATGGAGCCA  | CAACACTTAA  | ATTCACTCCA | GCTAGTTCCT | ATGCATTTTC  | TAGTTATACT | CATATATCAA | ATGATCAACA | ATATTTAGAA  | ATAGATCAGA  |
| 12810       | 12820       | 12830      | 12840      | 12850       | 12860      | 12870      | 12880      | 12890       | 12900       |
| GAGTAGTCGA  | TTCTAATATT  | ATTATCAAC  | AATTAATGAT | AACAGGACTT  | GGGATTATTG | AGACCTACCA | TAACCCACCT | ATAAGGACTT  | CTACACAAGA  |
| 12910       | 12920       | 12930      | 12940      | 12950       | 12960      | 12970      | 12980      | 12990       | 13000       |
| AATCACTCTC  | CATTTCGACA  | CTAGCTCATC | TTGTTGTGTT | AGAAGTGTAG  | ATGGTTGCCT | TATATGTGAG | AGCAATGGAG | AGGTTCCCTCA | GATCACTGTT  |
| 13010       | 13020       | 13030      | 13040      | 13050       | 13060      | 13070      | 13080      | 13090       | 13100       |
| CCCTATACTA  | ATACATTTGT  | ATATGATCCT | GATCCACTAG | CAGATTATGA  | GATTGCACAC | CTAGATTATC | TCTCCTACCA | AGCTAAAATT  | GGAAGTACAG  |
| 13110       | 13120       | 13130      | 13140      | 13150       | 13160      | 13170      | 13180      | 13190       | 13200       |
| ATTACTACTC  | ACTCACTGAT  | AAAATTGACC | TATTAGCACA | TTAACTGCA   | AAACAAATGA | TAAACTCAAT | AATTGGGTTA | GATGAAACAG  | TATCAATTGT  |
| 13210       | 13220       | 13230      | 13240      | 13250       | 13260      | 13270      | 13280      | 13290       | 13300       |
| CAATGATGCG  | GTTATCCCTAT | CTGACTATAC | TAATAACTGG | ATTAGTGAAT  | GTTCTTATAC | TAAGATAGAT | TTAGTTTTTA | AATTAATGGC  | ATGGAATTTT  |
| 13310       | 13320       | 13330      | 13340      | 13350       | 13360      | 13370      | 13380      | 13390       | 13400       |
| CTTCTTGAGC  | TTGCATTCCA  | GATGTACTAC | TTAAGGATAT | CATCTTGGAC  | AAATATATTT | GACTATACTT | ATATGACTTT | ACGCAGGATA  | CCCGGAACCTG |
| 13410       | 13420       | 13430      | 13440      | 13450       | 13460      | 13470      | 13480      | 13490       | 13500       |
| CTCTAAATAA  | TATTGCAGCT  | ACTATTAGCC | ATCCAAAATT | ATTAAGACGT  | GCAATGAATC | TTGATATTAT | CACCTCTATA | CATGCACCGT  | ATTTAGCTTC  |
| 13510       | 13520       | 13530      | 13540      | 13550       | 13560      | 13570      | 13580      | 13590       | 13600       |
| ATTAGATTAT  | GTCAAATTAA  | GTATTGATGC | AATTCAGTGG | GGAGTTAAAC  | AAGTTCCTGC | TGATTATCA  | AATGGAATTG | ATCTTGAAAT  | CTTGATTCTT  |
| 13610       | 13620       | 13630      | 13640      | 13650       | 13660      | 13670      | 13680      | 13690       | 13700       |
| TCAGAGGATT  | CAATGGAAAT  | TAGTGATAGG | GCAATGAATC | TCATTGCTAG  | AAAACATACT | CTCCTTGAC  | TTGTTAAAGG | TGAGAAGTAT  | ACTTTTCCAA  |
| 13710       | 13720       | 13730      | 13740      | 13750       | 13760      | 13770      | 13780      | 13790       | 13800       |
| AAATTAAAGG  | GATGCCACCA  | GAAGAAAAGT | GTTTAGTCTT | AACCTGAATAT | CTAGCAATGT | GTTATCAAAA | TACTCATCAC | TTAGATCCAG  | ATCTTCAAAA  |
| 13810       | 13820       | 13830      | 13840      | 13850       | 13860      | 13870      | 13880      | 13890       | 13900       |
| GTATTATAT   | AATCTAATA   | ATCCAAAATT | GACTGCATTT | CCCAGTAACA  | ACTTCTACTT | AACCTAGAAA | ATCCTTAATC | AAATTAGAGA  | ATCAGACGAA  |
| 13910       | 13920       | 13930      | 13940      | 13950       | 13960      | 13970      | 13980      | 13990       | 14000       |
| GGACAATATA  | TTATCACCTC  | ATATTATGAA | TCCTTCGAAC | AATTAGAAAC  | AGATATAAAT | CTTCACTCTA | CTTTAACTGC | TCCTTATGAT  | AATTTCAGAAA |
| 14010       | 14020       | 14030      | 14040      | 14050       | 14060      | 14070      | 14080      | 14090       | 14100       |
| CTCTAACAAA  | GTTGATTTTA  | TCCCTTGACA | TCTTTCCACA | TCCAGAATCT  | CTCGAGAAAT | ATCCTCTTCC | AGTTGATCAT | GACTCTCGAT  | CTGCAATTTT  |
| 14110       | 14120       | 14130      | 14140      | 14150       | 14160      | 14170      | 14180      | 14190       | 14200       |
| AACACTAATT  | CCAGGCCCTC  | CTTCTCATCA | TGTATTACGA | CCACTAGGAG  | TGTCATCCAC | AGCTTGGTAT | AAAGGGATAA | GTTATTGTAG  | ATACCTAGAA  |
| 14210       | 14220       | 14230      | 14240      | 14250       | 14260      | 14270      | 14280      | 14290       | 14300       |
| ACACAAAAGA  | TACAGACTGG  | TGATCATCTT | TATTTAGCCG | AAGGAAGCGG  | TGCTTCAATG | TCACTTCTAG | AACCTTATT  | TCCAGGAGAT  | ACTGTCTATT  |
| 14310       | 14320       | 14330      | 14340      | 14350       | 14360      | 14370      | 14380      | 14390       | 14400       |
| ATAATAGTCT  | TTTGTAGTAG  | GGAGAGAATC | CTCCACAGAG | AAACTATGCC  | CCTCTTCCAA | CTCAATTGTG | ACAGAGTGTT | CCATATAAAT  | TGTGGCAAGC  |
| 14410       | 14420       | 14430      | 14440      | 14450       | 14460      | 14470      | 14480      | 14490       | 14500       |
| TGATCTTGCT  | GATGATAGCA  | ATTTGATAAA | AGATTTTGTC | CCATTATGGA  | ATGGAACGGG | TGCAGTTACA | GACTTATCAA | CAAAGGATGC  | AGTTGCATTC  |

FIGURE 11E

```

14510      14520      14530      14540      14550      14560      14570      14580      14590      14600
ATAATACATA AAGTAGGAGC AGAGAAAGCA TCCCTTGTC ATATAGATCT CGAATCAACT GCTAATATAA ATCAGCAAAC TCTGTCCAGA TCCCAGATTC

14610      14620      14630      14640      14650      14660      14670      14680      14690      14700
ATTCATTAAT TATAGCAACT ACTGTTCTTA AGAGGGGTGG GATATTAATT TATAAAACAT CATGGCTTCC GTTTCTAGG TTTAGTCAAC TAGCAAGTCT

14710      14720      14730      14740      14750      14760      14770      14780      14790      14800
ACTTTGGTGC TTCTTTGACC GGATCCATCT AATACGTAGT AGCTATTCTG ATCCTCACAG TCATGAGGTT TATCTTGAT GTAGACTTGC CGCAGATTTT

14810      14820      14830      14840      14850      14860      14870      14880      14890      14900
AGAACTATCG GTTTCAGTGC AGCTCTAGTA ACTGCTACTA CTCTTCACAA TGACGGGATTC ACAACAATAC ATCCTGATGT TGTTTGTAGT TATTGGCAAC

14910      14920      14930      14940      14950      14960      14970      14980      14990      15000
ACCATCTTGA AAATGTTGGG AGAGTCGGAA AAGTAATTGA TGAGATACTT GATGGTTTAG CCACCAACTT CTTTCGCAGGA GATAATGGGC TTATTCTAAG

15010      15020      15030      15040      15050      15060      15070      15080      15090      15100
ATGTGGAGGA ACTCCAGCT CCAGAAAATG GTTAGAGATT GACCAGTTAG CATCATTTGA TTTGGTTCAA GATGCTCTGG TTACACTTAT CACTATACAC

15110      15120      15130      15140      15150      15160      15170      15180      15190      15200
CTAAAGGAAA TTATAGAAGT GCAGTCATCA CATAAGAGG ATTATACATC TCTCCTCTTC ACACCTTATA ATATTGGTGC AGCAGGGAAA GTCAGAACTA

15210      15220      15230      15240      15250      15260      15270      15280      15290      15300
TCATCAAATT AATTCTAGAA CGATCTTTAA TGTATACAGT CCGAAATTGG TTAGTTTAC CCAGTTCCAT CCGGGATTCT GTACGACAAG ATTTAGAATT

15310      15320      15330      15340      15350      15360      15370      15380      15390      15400
AGGGTCATTT AGATTAAATG CTATTTTAAG TGAACAGACA TTTCTTAAAA AGACCCCAC AAAAAAATAC TTACTTGATC AGCTTACAAG GACATATATA

15410      15420      15430      15440      15450      15460      15470      15480      15490      15500
TCAACCTTCT TTAACCTCTA CTCAGTCCTT CCCCTCCACC GTCCATATCA AAAACAAATA TGGAAAGCCT TAGGTAGTGT AATATATTGT TCGGAGACAG

15510      15520      15530      15540      15550      15560      15570      15580      15590      15600
TTGATATACC TCTAATTAAA GACATTCAGA TAGAAGATAT TAATGATTTT GAAGATATCG AGAGGGGTAT CGATGGCGAA GAATTATGAC AACAAATGATT

15610      15620      15630      15640      15650
ATAAGAACTC ATGATAGTTT TATTTAAGAA AAACATATTG ATTTTCCCTT TGGT

```

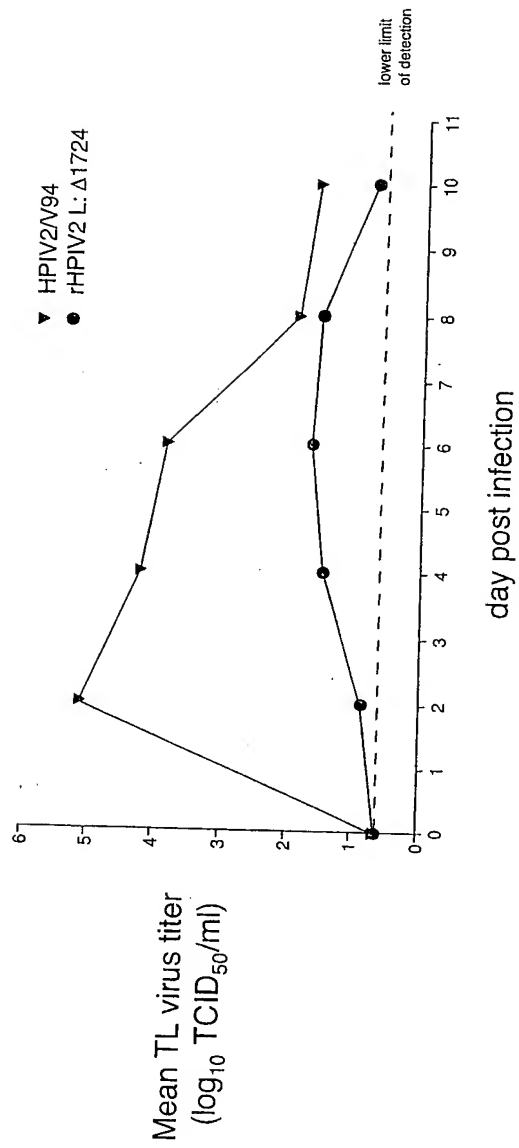
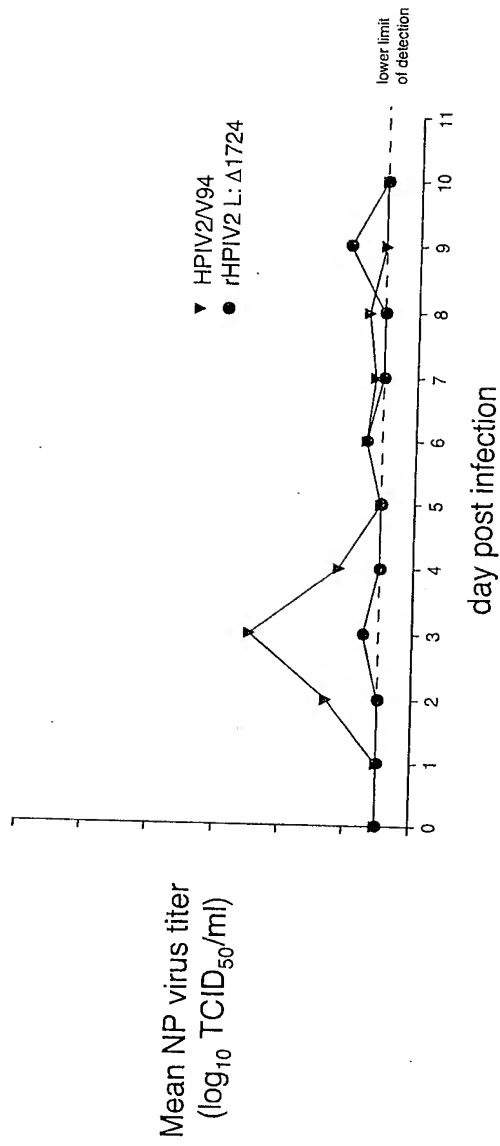


FIGURE 12

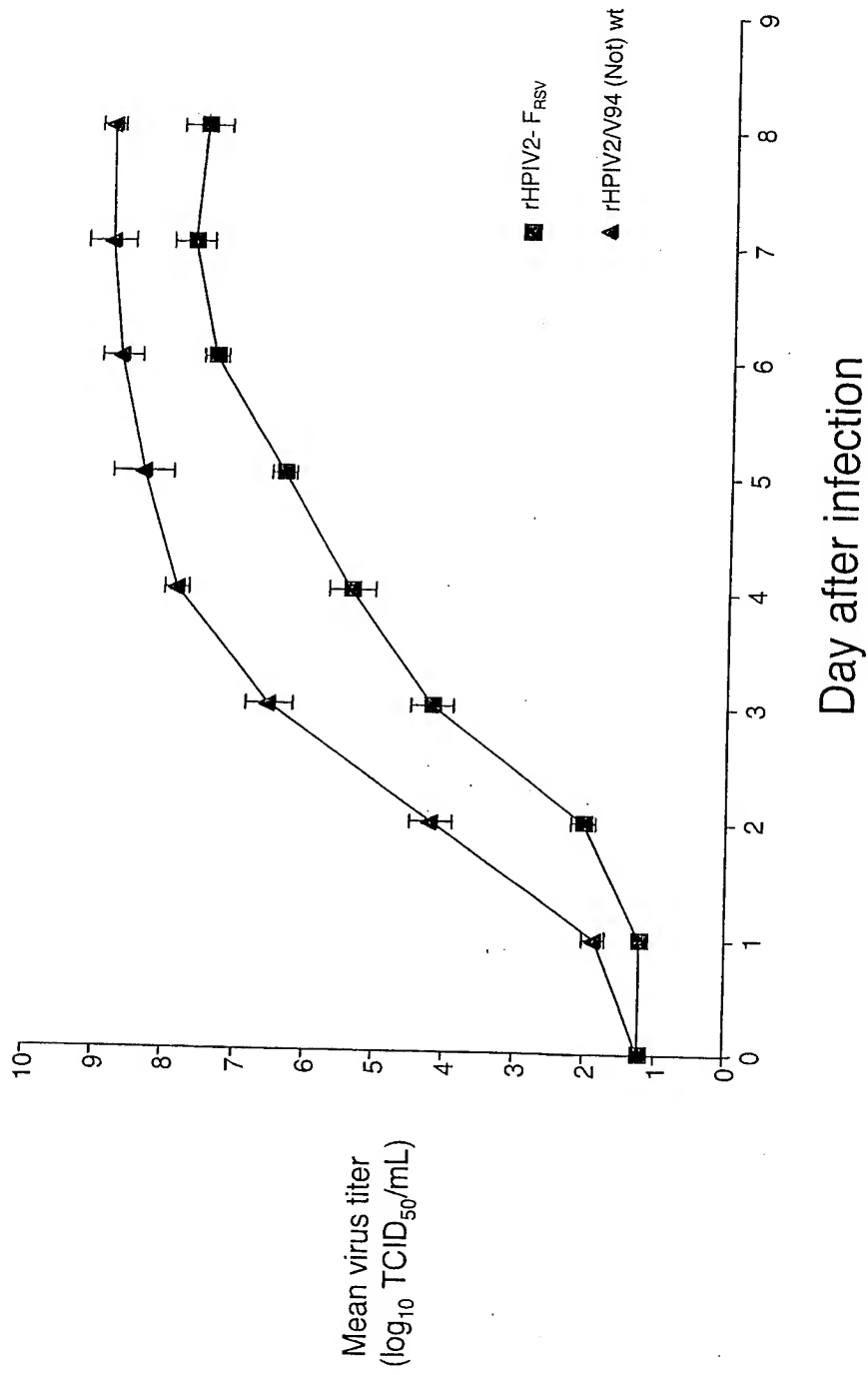


FIGURE 13

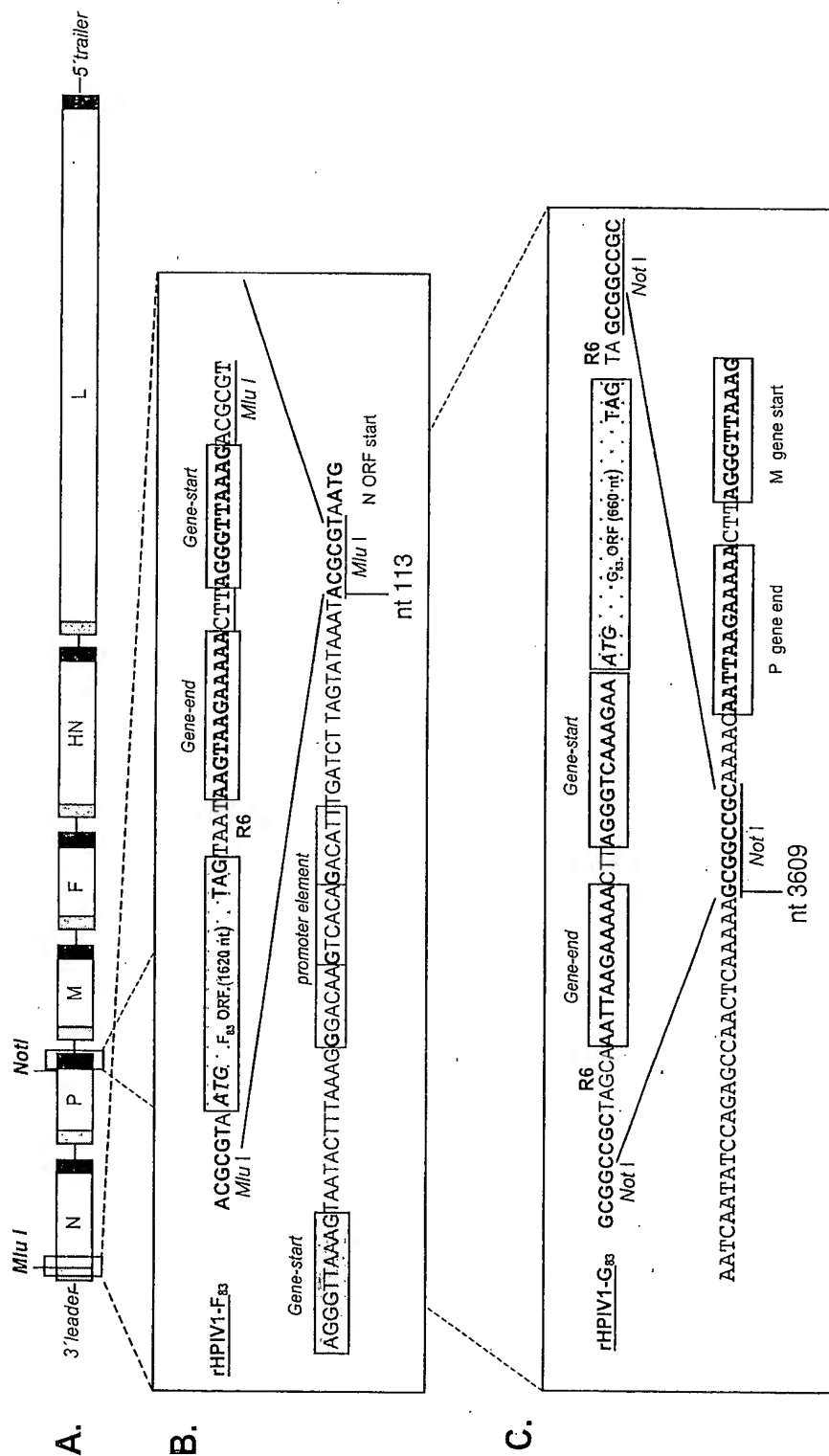


FIGURE 14